



August 31, 2017

Ms. Tonya Howell
Remedial Project Manager
U.S. Environmental Protection Agency, Region 7
11201 Renner Blvd
Lenexa, Kansas 66219

Subject: **Engineering Evaluation/Cost Analysis, Revision 03**
 Des Moines TCE NPL Site, Operable Unit 04, Buildings
 Des Moines, Iowa
 U.S. EPA Region 7 START 4, Contract No. EP-S7-13-06, Task Order No. 0144
 Task Monitor: Tonya Howell

Dear Ms. Howell:

Tetra Tech, Inc. is submitting the attached Engineering Evaluation/Cost Analysis (Revision 03) report regarding the Des Moines TCE NPL site, Operable Unit 04, Buildings, in Des Moines, Iowa.

If you have any questions or comments, please contact me at (816) 412-1767.

Sincerely,

A handwritten signature in cursive script that reads 'Mike Williams'.

Mike Williams, CPG
START Project Manager

A handwritten signature in cursive script that reads 'Ted Faile'.

Ted Faile, PG, CHMM
START Program Manager

Enclosures

cc: Debra Dorsey, START Project Officer (cover letter only)

**DES MOINES TCE NPL SITE
OPERABLE UNIT 04
BUILDINGS
DES MOINES, IOWA
ENGINEERING EVALUATION/COST ANALYSIS
REVISION 03**

Superfund Technical Assessment and Response Team (START) 4

Contract No. EP-S7-13-06, Task Order 0144

Prepared For:

U.S. Environmental Protection Agency
Region 7
11201 Renner Blvd.
Lenexa, Kansas 66219

August 31, 2017

Prepared By:

Tetra Tech, Inc.
415 Oak Street
Kansas City, Missouri 64106
(816) 412-1741

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ACRONYMS

ACM	Asbestos-containing material
AM	Action Memorandum
AOC	Area of contamination
ARAR	Applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	<i>Code of Federal Regulations</i>
COC	Chemical of concern
DCE	Dichloroethene
Dico	Dico, Inc.
EPA	U.S. Environmental Protection Agency
EE/CA	Engineering Evaluation/Cost Analysis
HDPE	High-density polyethylene
HHRA	Human health risk assessment
KDHE	Kansas Department of Health and Environment
LDR	Land disposal restriction
mil	0.001 inch
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operations and maintenance
OU	Operable unit
PCB	Polychlorinated biphenyl
PCE	Tetrachloroethene
ppm	Parts per million
RACER	Remedial Action Cost Engineering and Requirements
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
SPA	South Pond Area
START	Superfund Technical Assistance and Response Team
TBD	To be determined
TCE	Trichloroethene
Tetra Tech	Tetra Tech, Inc.
TSCA	Toxic Substances Control Act
US	United States
U.S.C.	<i>United States Code</i>

EXECUTIVE SUMMARY

This Engineering Evaluation/Cost Analysis (EE/CA) report evaluates technologies and alternatives for conducting a non-time critical removal action at Operable Unit (OU) 04 related to demolition of buildings at the Des Moines Trichloroethene (TCE) site (site) in Des Moines, Iowa. The non-time critical removal action is taken pursuant to the authority in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section (§) 104(a) (40 *United States Code [U.S.C]* § 9604[a]) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) at 40 Code of Federal Regulations (CFR) § 300.415. This report was prepared in accordance with the NCP, U.S. Environmental Protection Agency's (EPA) Guidance on Conducting Non-Time-Critical Removal Actions under CERCLA (EPA 1993a), Use of Non-Time Critical Removal Authority in Superfund Response Actions (EPA 2000), and Response Actions at Sites with Contamination Inside Buildings (EPA 1993b).

The site is in south-central Des Moines on the east side of the Raccoon River. In all, the site encompasses more than 200 acres of which the Dico, Inc. (Dico) property makes up approximately 43 acres. The Dico property is southwest of the intersection of W. Martin Luther King Jr. Parkway and SW 16th Street in Des Moines, Polk County, Iowa. The site is within Section 8, Township 78 North, Range 42 West.

The Dico property includes several buildings used for a variety of industrial operations throughout its history. Buildings remaining on the Dico property to be addressed in this report include the Production Building; Buildings 1, 2, and 3; and slab foundations remaining for the Maintenance Building and Buildings 4 and 5. A former office building is also located on the Dico property, but is not addressed in this report.

In addition to the buildings, the Dico property includes a large area of soil contamination covered by an asphalt cap and building foundations. The extent of soil contamination beneath the buildings and slab foundations has yet to be defined. A drainage feature at the south end of the site is referred to as the "South Pond Area" or "SPA." Surface water and sediments at the SPA have been adversely impacted by site contaminants associated with the buildings (see Figure 2). Finally, a groundwater extraction system and air stripping tower are being used at the property to remove and treat contaminated groundwater.

For the purposes of this EE/CA, the Production Building is included as part of the site. However, since the Production Building was not part of the 1996 Record of Decision (ROD), it could be addressed outside of the EE/CA under a separate action. The SPA was identified in the 1996 Feasibility Study (Black and Veatch Special Projects Corp. [Black and Veatch] 1996) as part of OU4, called the South

Pond/Drainage Area Source Control OU. OU4 was originally delineated to address pesticide contamination in soils and buildings in the southeast portion of the site.

For approximately 40 years, historical operations at the site have included a variety of industrial uses and operations—steel wheel manufacturing, chemical and herbicide distribution, and pesticide formulation processes. Releases during Dico’s operations at the site included the following: TCE, 1,2-dichloroethene (DCE), and vinyl chloride in groundwater; residual pesticides, dioxins, polychlorinated biphenyls (PCBs), and metals in shallow soils; and pesticides, dioxins, and PCBs within buildings and drainage areas.

In June 2016, Tetra Tech, Inc. (Tetra Tech) conducted an environmental characterization of buildings and foundations on site. Wipe samples were collected from building surfaces, building material samples were collected from various materials within the buildings, and concrete core samples were collected from building foundations and slabs. Consistent with historical sampling, results of the site characterization indicated the presence of pesticides, PCBs, and dioxins in several building materials across the site.

Several pesticides were detected in samples of building materials and concrete, and in wipe samples collected during the sampling event. Pesticides detected in the slab foundations of the Maintenance Building and Building 4 contained Resource Conservation and Recovery Act (RCRA) listed wastes as a result of spills of listed waste when Aldrin (Hazardous Waste Code P004) stored in the Maintenance Building was transferred to Building 4 and sprayed onto fertilizer. A 2,000-gallon vessel formerly stored in the Maintenance Building was used to heat Aldrin during formulation operations (Eckenfelder Inc. 1992). The Aldrin vessel and surrounding soils were removed as part of a previous response action at the site.

It is unclear if contamination within the remaining buildings and slab foundations on site derived from poor waste management or releases of product that is not RCRA listed waste. Therefore, the source is unknown and is not considered a RCRA listed waste. Pesticides detected in the Production Building; Buildings 1, 2, and 3; and the slab foundation remaining for Building 5 may contain RCRA characteristic waste and therefore would be sampled prior to disposal.

Due to changing land use—rezoning from industrial to Central Business Mixed Use District C-3 B designation—demolition of contaminated on-site buildings is required. Potentially toxic and hazardous substances within the buildings and slab foundations present an actual or potential exposure to human health and the environment. This EE/CA report evaluates alternatives for addressing potential human health risk associated with buildings and slabs that remain on site. This EE/CA report addresses the buildings and slabs that remain on site and does not include an evaluation of alternatives to address

groundwater beneath the buildings and slabs. The remedy selected for site soils in the 1996 ROD remains in place and has been determined to be protective of human health and the environment (EPA 2013). However, it is important to note that this protectiveness determination was based on the fact that contaminated site soils remain covered, thereby preventing direct exposure to human or environmental receptors. If building foundations are removed, there could be an unacceptable health threat associated with exposures to contaminated soils that become uncovered. However, the extent of soil contamination beneath the buildings and slab foundations has yet to be defined. If slab foundations are removed, soils will be sampled to determine if an unacceptable health risk is present.

Removal action objectives for the site buildings were developed and include:

- ☐ Eliminate human exposure via inhalation, incidental ingestion, and dermal absorption to contamination present within site buildings.
- ☐ Prevent human exposure to chemicals of concern (COC) in potentially contaminated soil at levels that pose unacceptable risk to commercial and recreational uses.

Alternatives to address the buildings and slab foundations, which will meet these new removal action objectives, are evaluated in this EE/CA.

Cleanup levels for building material and slab foundations were not developed because building materials cannot be compared with published or site-specific risk-based screening levels for soil, sediment, surface water, groundwater, air or other natural media. Cleanup levels for soil have also not been developed. However, if slab foundations are removed at the site, soils will be sampled to determine if an unacceptable health risk is present and if present, cleanup levels will be developed for soil.

Removal action alternatives evaluated in this EE/CA report vary in implementability, effectiveness and cost. These alternatives include: (1) No Action, (2) Building Demolition with Off-site Disposal, and (3) Building Demolition with On-site Containment. Alternatives 2 and 3 include the demolition of on-site buildings including the Production Building, Buildings 1, 2, and 3, and the slab foundations of the former Maintenance Building and Buildings 4 and 5. Both Alternatives would include an asbestos survey and abatement of asbestos material prior to demolition. Materials classified as asbestos-containing material (ACM) will be disposed of off-site as special waste. Insulation in the Production Building and Buildings 1, 2, and 3 contains PCBs based on historical sampling data and the 2016 site characterization. Insulation-containing PCBs will be removed prior to demolition of buildings and disposed of as appropriate and in accordance with state requirements. During demolition, metal materials (i.e., rebar,

steel beams) will be separated, decontaminated if necessary and recycled at a local scrap yard. Residue from decontamination procedures determined to contain PCBs will be disposed of as PCB remediation waste. Demolition debris remaining following the above activities will be sampled to determine the concentration of any site contaminants and whether the materials are classified as a RCRA characteristic waste. These sampling results will determine appropriate disposal methods and locations. Demolition equipment will be decontaminated on site. No soils will be removed as part of either alternative.

EPA's preferred alternative for addressing contamination within buildings is Alternative 2, Building Demolition with Off-site Disposal, and includes demolishing buildings and slab foundations, disposing of any hazardous debris at an off-site landfill, and capping exposed soil with a vegetative cover, depending on potential unacceptable risk from site soils and redevelopment plans. The cost for this option is estimated to be between \$11,127,000 and \$12,846,000 depending on the amount of demolition debris determined to be hazardous and the need for the vegetative cover. This alternative achieves substantial risk reduction and addresses the buildings and slab foundations as a source of contamination at the site. The proposed non-time critical removal action will be consistent with the final remedy for the site.

It is important to note that there may be opportunities for substantial cost savings. For example, slab foundations may be able to remain on site depending upon the plan for site development, such as one or more new mixed-use buildings at the same locations. In addition, the vegetative cover may not be necessary depending on the plan for site development and the timing of the implementation of that plan. Potential cost savings for each alternative are discussed in Sections 5.2.3 and 5.3.3 and are shown in Tables 2 and 3 in Section 6.0. The estimated cost of Alternative 2 is between \$11,127,000 and \$12,846,000. If the Production Building is not included as part of Alternative 2, the estimated cost would be between \$5,226,000 and \$6,945,000. The potential cost savings for Alternative 2 range from \$232,000 to \$4,031,000. These cost savings are discussed in Section 5.2.3. The estimated cost of Alternative 3 is \$13,939,000. If the Production Building is not included as part of Alternative 3, the estimated cost would be about \$9,333,000. The potential cost savings for Alternative 3 range from \$582,000 to \$3,620,000. These cost savings are discussed in Section 5.3.2.

1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) directed the Tetra Tech Inc. (Tetra Tech) Superfund Technical Assessment and Response Team (START) to prepare an Engineering Evaluation/Cost Analysis (EE/CA) report regarding the Des Moines Trichloroethene (TCE) site (site) in Des Moines, Iowa (Figure 1) to support the completion of a non-time critical removal action related to demolition of buildings at the site. The non-time critical removal action is taken pursuant to the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) Section (§) 104(a) (40 *United States Code [U.S.C]* § 9604[a]) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) at 40 Code of Federal Regulations (CFR) § 300.415.

According to 40 CFR § 300.415 (b), at any release, regardless of whether the site is included on the National Priorities List (NPL), where the lead agency makes the determination that there is a threat to public health or welfare of the United States or the environment, the lead agency may take any appropriate removal action to abate, prevent, minimize, stabilize, mitigate, or eliminate the release or the threat of release. Factors applicable to the removal action planned for this site are as follows:

- (i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants;
- (ii) High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate;
- (iii) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released; and
- (iv) The availability of other appropriate federal or state response mechanisms to respond to the release.

In addition to considering the NCP factors above, the following factors were considered in determining whether to employ a Non-Time Critical Removal Action:

- 1. Time-sensitivity of the response;
- 2. Complexity of both the problems to be addressed and the action to be taken;
- 3. Comprehensiveness of the proposed action; and
- 4. Likely cost of the action.

The goals of an EE/CA, according to EPA's Guidance on Conducting Non-Time-Critical Removal Actions under CERCLA, are based on the relevant factors in 40 CFR § 300.415 as described above and the following: (1) to satisfy environmental review requirements for removal actions, (2) to satisfy

administrative record requirements for improved documentation of removal action selection, and (3) to provide a framework for evaluating and selecting alternative technologies (EPA 1993a). This EE/CA addresses Operable Unit (OU) 04 related to demolition of buildings.

The site is in south-central Des Moines on the east side of the Raccoon River (Figure 1). In all, the site encompasses more than 200 acres of which the Dico property makes up approximately 43 acres. The Dico property is southwest of the intersection of W. Martin Luther King Jr. Parkway and SW 16th Street in Des Moines, Polk County, Iowa. The site is within Section 8, Township 78 North, Range 42 West. The Dico property includes several buildings used for a variety of industrial operations throughout its history. Buildings remaining on the Dico property to be addressed in this report include the Production Building; Buildings 1, 2, and 3; and slab foundations remaining for the Maintenance Building and Buildings 4 and 5. A former office building is also located on the Dico property, but is not addressed in this report. In addition to the buildings, the Dico property includes a large area of soil contamination covered by an asphalt cap, a groundwater extraction system and air stripping tower, and a surface water feature at the south end of the site that is referred to as the “South Pond Area” or “SPA” (see Figure 2). For the purposes of this EE/CA, the Production Building is also included as part of the site. However, since the Production Building was not part of the 1996 Record of Decision (ROD), it could be addressed outside of the EE/CA under a separate action. The SPA was identified in the 1996 Feasibility Study as part of OU4, called the South Pond/Drainage Area Source Control OU. OU4 was originally delineated to address pesticide contamination in soils and buildings in the southeast portion of the site.

For approximately 40 years, historical operations at the site have included a variety of industrial uses and operations—steel wheel manufacturing, chemical and herbicide distribution, and pesticide formulation processes. Releases during Dico’s operations at the site included the following: TCE, 1,2-dichloroethene (DCE), and vinyl chloride in groundwater; residual pesticides, dioxins, polychlorinated biphenyls (PCBs), and metals in shallow soils; and pesticides, dioxins, and PCBs within buildings and drainage areas. See the 1996 Feasibility Study for more information (Black and Veatch 1996).

The site is divided into four OUs:

- ☐ OU1 – groundwater TCE plume.
- ☐ OU2 – originated as source soils associated with TCE groundwater contamination, but later focused on residual pesticides and metals in shallow soils.

- OU3 – source area of tetrachloroethene (PCE) groundwater contamination north of the site.
- OU4 – pesticides, dioxins, and PCBs in several buildings onsite, and in drainage areas of the site, including the SPA.

The 1986 ROD addressed OU1 (EPA 1986), the 1992 ROD addressed OU3 (EPA 1992), and the 1996 ROD addressed OU2 and OU4 (EPA 1996). The 1996 ROD for OU2 and OU4 selected Building Alternative 2 – Limited Action and Soil Alternative 2 – Limited Action. Under these remedies, contamination within the buildings would remain encapsulated in place and exposure to the contamination would be controlled through long term maintenance of the encapsulation actions and land use controls to maintain an industrial use of the property (both engineered controls and institutional controls). In the mid-1990s, several response actions occurred to address exposures to contamination at the site in surface soils and buildings. These actions included capping onsite soils, cleaning interior building surfaces, repairing and sealing building insulation, and applying an encapsulant to building interior surfaces. Furthermore, a group of potentially responsible parties excavated contaminated soils from a drainage ditch adjacent to the site and from certain areas around the SPA (EPA 2012).

The 5-year review completed in April 2013 deferred the protectiveness determinations for OU4 and recommended sampling the SPA to assess ecological risks (EPA 2013). The 2013 5-year review also identified risk to trespassers in the buildings at OU4, due to broken windows and unsecured entrances in the buildings where the encapsulation over the contaminated areas has failed, and recommended monitoring to determine the extent of exposure to trespassers. Sampling and an ecological risk assessment for the SPA was completed in October 2015, and indicated an unacceptable risk to ecological receptors due to pesticide and PCB contamination (EPA 2015). An addendum to the 5-year review was then completed in 2016 (EPA 2016). This addendum indicated that trespassers from the indigent community were removed from the buildings at OU4 and security measures were put in place to prevent additional trespassing. The addendum recommended continued efforts to verify that the buildings containing contamination be made inaccessible to trespassers and updating the human health risk assessment (HHRA) to assess potential human health risk. This addendum indicated that the remedy at OU4 is protective regarding contamination in the buildings, but is not protective in the SPA due to the conclusion of the 2015 ecological risk assessment. A HHRA addendum was then completed in January 2017 as recommended by the 2016 5-year review addendum, and took into account new potential land uses at the OU and new data that had been acquired at the OU (Tetra Tech 2017). The HHRA addendum showed unacceptable risk to human receptors at the SPA. However, the addendum did not evaluate risk based on contamination in building materials because building materials cannot be compared with published or site-specific risk-based screening levels for soil, sediment, surface water,

groundwater, air or other natural media. Manufacturing operations at the site have ceased, and the only activities on site relate to operation and maintenance of the pump and treat remediation system associated with OU1 and maintenance of the asphalt cap covering contaminated site soils. The site is fenced, and the property owner provides site security.

Land use in the surrounding area is changing, and much of this area has been rezoned since the remedy was selected for OU2 and OU4 in the 1996 ROD. The City of Des Moines is planning on conducting a major redevelopment project in the River Point West area east of the Dico property. The site was previously zoned for industrial use. However, on June 13, 2005, most of the Dico property was rezoned to the Central Business Mixed Use District C-3 B designation. This allows for a variety of uses including residential, recreational, office, commercial, and retail. The changing land use of the site by its rezoning from industrial to mixed use requires the demolition of contaminated on-site buildings. Potentially toxic and hazardous substances within the buildings and slab foundations present an actual or potential exposure to human health and the environment.

Due to the changing land use, this EE/CA report evaluates alternatives for addressing human health risk associated with buildings and slab foundations that remain on site in a way that is compatible with changing land use. This EE/CA report addresses the buildings and slab foundations that remain on site and does not include an evaluation of alternatives to address contaminated groundwater that may be beneath the buildings and slabs. The remedy selected for site soils in the 1996 ROD remains in place and has been determined to be protective of human health and the environment (EPA 2013). However, it is important to note that this protectiveness determination was based on the fact that contaminated site soils remain covered, thereby preventing direct contact exposures to contaminated soils. If building foundations are removed, there could be an unacceptable health threat associated with exposures to any contaminated soils that become uncovered (Figure 2 is a site layout map). However, the extent of soil contamination beneath the buildings and slab foundations has yet to be defined. If slab foundations are removed, soils will be sampled to determine if an unacceptable health risk is present.

This EE/CA report was prepared in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), EPA's Guidance on Conducting Non-Time-Critical Removal Actions under CERCLA (EPA 1993a), Use of Non-Time Critical Removal Authority in Superfund Response Actions (EPA 2000), and Response Actions at Sites with Contamination Inside Buildings (EPA 1993b). The NCP defines appropriate remediation as a cost-effective action that effectively mitigates and minimizes threats to and provides adequate protection of human health, welfare, and the environment. Removal action alternatives evaluated in this EE/CA report vary in cost and protection they afford to human health.

2.0 SITE CHARACTERIZATION

This section describes the extent of contamination at the site and identifies the applicable or relevant and appropriate requirements as they apply to each removal action alternative considered. A complete site characterization was done during the 1996 Feasibility Study prepared by Black and Veatch (Black and Veatch 1996).

2.1 EXTENT OF CONTAMINATION

In June 2016, Tetra Tech conducted an environmental characterization of buildings, foundations, soil below buildings, and the SPA. The building investigation included collection of the following samples for analyses for chemicals of concern (COC):

- ☐ Wipe samples from building surfaces
- ☐ Building material samples
- ☐ Concrete core samples from building foundations and slabs.

Consistent with historical sampling, results of the site characterization indicated the presence of pesticides, PCBs, and dioxins in several building materials across the site. Sample locations are shown on Figures 3 through 5; analytical summary tables (Tables 1 through 3 attached) correspond to each figure.

2.2 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

CERCLA § 121(d), 42 U.S.C. § 9621(d), requires that remedial actions attain—or the decision document justify waiver of—environmental regulations, standards, or criteria promulgated under federal or more stringent state laws determined to be applicable or relevant and appropriate requirements (ARAR). While CERCLA § 121(d) does not apply to removal actions, the NCP at 40 CFR § 300.415(j) provides that removal actions “shall to the extent practicable considering the exigencies of the situation, attain applicable or relevant and appropriate requirements (ARARs) under federal environmental or state environmental or facility siting laws.” EPA has evaluated and identified potential ARARs for the non-time critical removal action.

The NCP at 40 *Code of Federal Regulations* (CFR) § 300.5 defines applicable requirements as “those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at a CERCLA site...” The NCP at 40 CFR § 300.5 defines relevant and appropriate requirements

as “those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not ‘applicable’ to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations *sufficiently similar to those encountered at the CERCLA site and that their use is well suited to the particular site...*” (emphasis added).

Compliance with ARARs requires compliance only with the substantive requirements specified within the statute or regulation, and does not require compliance with procedural requirements, such as permitting when response actions are conducted entirely on site. CERCLA § 121(e)(1) states that “No Federal, State, or local permit shall be required for the portion of any removal or remedial action conducted entirely onsite, where such remedial action is selected and carried out in compliance with this section.” For any portion of a removal action conducted off site, such as off-site disposal in a permitted landfill, compliance with applicable requirements and with both substantive and procedural components is required.

Potential federal and state ARARs are identified in this EE/CA. Potential federal ARARs were identified based on a review of site-specific characteristics and removal action alternatives under evaluation, and federal environmental statutes and regulations. Potential state ARARs were identified based on a review of site-specific characteristics and removal actions under evaluation, and state-delegated environmental programs and other state environmental statutes and regulations. For a state requirement, including an applicable state requirement, to be identified as a potential state ARAR, the state requirement must be more stringent than the corresponding federal ARAR. EPA will select the final ARARs (no longer potential) in the Action Memorandum (AM).

ARARs are generally divided into three categories: chemical-, location-, and action-specific requirements. Chemical-specific ARARs are generally health- or risk-based numerical values or methodologies applied to site-specific conditions that result in establishment of cleanup levels. These values establish acceptable amounts or concentrations of chemicals that may be found in, or discharged to, the ambient environment. Chemicals found in the on-site buildings and building materials include pesticides, PCBs, and dioxins. No statutory or regulatory standards for pesticides or dioxins in building debris have been established that specify potential cleanup levels. PCBs found in the building material are in bulk product waste and are not considered PCB remediation waste because at the time of designation for disposal, the PCB-contaminated building material is still attached to the building and the building demolition will be completed in the removal action (EPA 2012). However, PCB waste removed from metal materials to be recycled will be considered PCB remediation waste. Location-specific ARARs

are restrictions or requirements placed on protected locations, including historic places, wetlands, and sensitive ecosystems or habitats. The site is not within a 100-year floodplain due to the presence of a levee. However, the site is within a 500-year floodplain, so potential location-specific ARARs were identified for protection of permanent and temporary facilities constructed at the site. No other protected or regulated resources are present at the building site, so no other potential location-specific ARARs were identified. Potential federal location-specific ARARs are identified in Table A-1 of Appendix A. No potential state location-specific ARARs were identified for protection of the floodplain. Potential action-specific ARARs are requirements triggered by a removal action on site. Action-specific ARARs generally do not determine the removal alternative; rather, they determine how an alternative must be implemented. No potential action-specific ARARs were identified for or are necessary for the No Action alternative. Potential federal action-specific ARARs are listed in Table A-2 of Appendix A. Potential state action-specific ARARs are listed in Table A-3 of Appendix A. Table 1 in Section 6.0 summarizes feasibility options.

3.0 NON-TIME CRITICAL REMOVAL ACTION AND REMOVAL ACTION OBJECTIVES

Several pesticides, dioxins and PCBs were detected in samples of building materials and concrete, and in wipe samples collected during the June 2016 sampling event. Pesticides detected in the slab foundations of the Maintenance Building and Building 4 contained Resource Conservation and Recovery Act (RCRA) listed wastes as a result of spills of listed waste when Aldrin (Hazardous Waste Code P004) stored in the Maintenance Building was transferred to Building 4 and sprayed onto fertilizer. A 2,000-gallon vessel stored in the Maintenance Building was used to heat Aldrin during formulation operations (Eckenfelder Inc. 1992).

It is unclear if contamination within the remaining buildings and slab foundations on site derived from poor waste management or releases of product that is not RCRA listed waste. Therefore, the source is unknown and is not considered a RCRA listed waste. The Production Building and Buildings 1, 2, and 3; and the slab foundation remaining for Building 5 may contain RCRA characteristic waste and therefore would be sampled prior to disposal.

Due to the change in land use from industrial to Central Business Mixed District C-3 B designation, as noted in Section 1.0, the remedy selected in the 1996 ROD is no longer protective of human health and the environment (EPA 2013, EPA 2016). Cleanup of site buildings and slab foundations will be implemented as a Non-Time Critical Removal Action under Section 104 of CERCLA, 42 US Code (USC) § 9604 and 40 CFR § 300.415 of the NCP. Historical remedial action objectives are included in the 1996 ROD (EPA 1996). Additional alternatives to address the buildings and slab foundations, which will meet these new removal action objectives, are evaluated in this EE/CA.

Removal action objectives for the site buildings include:

- ☐ Eliminate human exposure via inhalation, incidental ingestion, and dermal absorption to contamination present within site buildings.
- ☐ Prevent human exposure to COCs in potentially contaminated soil at levels that pose unacceptable risk to commercial and recreational users.

Cleanup levels for building materials and foundation slabs were not developed because building materials cannot be compared with published or site-specific risk-based screening levels for soil, sediment, surface water, groundwater, air or other natural media. Cleanup levels for soil have not been developed because the extent of potential contamination is unknown. However, if slab foundations are removed at the site, soils will be sampled to determine if an unacceptable health risk is present and if present, cleanup levels will be developed for soil.

4.0 IDENTIFICATION OF REMOVAL ACTION ALTERNATIVES

Tetra Tech evaluated three alternatives addressing buildings and slabs that remain at the site, applying the three broad criteria described in EPA's Guidance on Conducting Non-Time-Critical Removal Actions under CERCLA (EPA 1993a). The first alternative, which serves as a baseline, is known as the "No Action" alternative. The second alternative is building demolition with off-site disposal (Figure 6). The third alternative is building demolition with on-site containment that includes crushing building material on site, spreading the material across the site, and covering the fill with a cap (Figures 7 and 8). The following sections describe these alternatives.

4.1 ALTERNATIVE 1 – NO ACTION (BASELINE)

Alternative 1 is the CERCLA-required no-action alternative in which no removal action is undertaken. This alternative does not include further land use controls, containment, removal, treatment, or other mitigating actions beyond what has already been put in place as a result of the 1996 ROD, including the continued maintenance of the remedy in place and the performance of 5-year reviews as required by the NCP. Under Alternative 1, because no action is taken, the site remains unchanged. However, the changing land use of the site by its rezoning from industrial to mixed use, requires the demolition of contaminated on-site buildings. Potentially toxic and hazardous substances within the buildings and slab foundations present an actual or potential exposure to human health and the environment. Under Alternative 1, building contaminants that pose risk to human health would remain in place. The no action alternative provides a baseline for comparison to the other removal action alternatives.

4.2 ALTERNATIVE 2 – BUILDING DEMOLITION WITH OFF-SITE DISPOSAL

Alternative 2 includes demolition of buildings (Production Building and Buildings 1, 2, and 3) and slab foundations (Maintenance Building and Buildings 4 and 5) that currently remain on site, and disposal of demolition debris at an off-site landfill. Alternative 2 would include removal of PCB-contaminated insulation and asbestos prior to demolition activities. After demolition activities, areas previously hosting the buildings and slab foundations would be backfilled with soil and capped with a vegetative cover. However, it should be noted that a vegetative cap may not be required if soil samples are collected from the areas previously hosting the buildings and slab foundations and it is verified that levels of COCs do not exceed action levels (see Section 5.2.3 for potential cost savings without a vegetative cap).

Assumptions for Alternative 2 are as follows:

1. Collection of an estimated 100 samples is anticipated during the Asbestos Survey. Costs for this survey and report were estimated by application of the "RCRA Facility Investigation" technology in RACER. Cost items were removed that did not apply.
2. Roofing tar and boiler/piping insulation contain asbestos, and will be abated prior to demolition of buildings. This will be classified as asbestos-containing material (ACM) and disposed of off site as special waste. This includes roofing at the Production Building and Buildings 1, 2, and 3; and boiler/piping insulation at Building 1.
3. Insulation at the Production Building and Buildings 1, 2, and 3 is presumed to contain PCBs and will be removed prior to demolition of buildings and disposed of in accordance with 40 CFR § 761. Due to the additional restrictions associated with PCB disposal in Iowa, disposal will also be based on concentration as follows:
 - a. Insulation and material with PCB concentrations > 50 parts per million (ppm) will be disposed of as bulk product waste at a Toxic Substances Control Act (TSCA)-approved landfill.
 - b. Non-hazardous waste with PCB concentrations < 50 ppm will be disposed of at a solid waste landfill.
4. The Production Building is assumed to have no contamination that can be classified as hazardous waste by 40 CFR § 261, with the exception of PCBs in insulation and asbestos defined above, and debris can therefore be disposed of as non-hazardous waste at a local landfill. Portions of the concrete foundation may also be suitable for reuse as fill or road base, or other beneficial use.
5. Portions of the Maintenance Building and Building 4 foundations contain RCRA listed waste which will be disposed of at a RCRA Subtitle C landfill. The rest of these foundations not containing pesticides would be managed as solid waste or could be reused as fill or road base if appropriate.
6. Remaining slab foundations will be removed.
7. During demolition activities, metal materials (i.e., rebar, steel beams, etc.) will be separated and decontaminated as necessary. Metals will be recycled at a local scrap yard. It is assumed that the scrap yard will pay \$90 per ton of metal based on current prices as of February 16, 2017. Residue from decontamination procedures determined to contain PCBs will be disposed of as PCB remediation waste.
8. For the purpose of this EE/CA, the following assumptions were made regarding the amount of metal within the structures on site:

Structure	Construction Material	Percent of Structure that Contains Metal
Slab Foundations	Reinforced Concrete	1%
Production Building (76%)	Masonry	10%
Production Building (24 %)	Steel	100%
Building 1	Masonry	10%
Building 2	Masonry	10%
Building 3	Steel	100%
Walkway	Steel	100%

These assumptions are based on review of available photographs of the structures.

9. Demolition debris remaining following the above activities will be sampled to determine the concentration of any PCBs and whether the materials are classified as a RCRA characteristic waste. These sampling results will determine appropriate disposal methods and locations. For the purposes of this EE/CA, 25 to 75% of the remaining demolition debris is assumed to be RCRA hazardous waste due to RCRA characteristic waste. RCRA hazardous waste and material with PCB concentrations > 50 ppm will be disposed of at a TSCA-approved and RCRA Subtitle C landfill. All remaining debris determined to be non-hazardous will be disposed of at a local landfill or designated for beneficial use as appropriate.
10. Demolition equipment will require decontamination. Equipment decontamination operations are anticipated to last 1 week. Costs include construction of a decontamination facility pad and disposal of wash water.
11. Disposal of demolition debris containing RCRA listed and characteristic wastes and PCB concentrations > 50 ppm will occur at a TSCA-approved and RCRA Subtitle C landfill. Transportation by rail and disposal charges will be \$282.81 per ton, based on estimates received from disposal facilities.
12. Disposal of non-hazardous demolition debris will occur at the Metro Park East Landfill in Des Moines, Iowa at a rate of \$39.90 per ton. Transportation by truck to the landfill will be \$22.37 per ton.
13. The volume to weight conversion factor for construction and demolition waste is 0.625 tons per cubic yard based on the Kansas Department of Health and Environment (KDHE) Bureau of Waste Management (KDHE 2010). An Iowa-specific weight conversion was not found.
14. No soil will be removed as part of this alternative.
15. Land disposal restrictions (LDR) are applicable as appropriate.

4.3 ALTERNATIVE 3 – BUILDING DEMOLITION WITH ON-SITE CONTAINMENT

Alternative 3 includes demolishing buildings (Production Building and Buildings 1, 2, and 3) that currently remain on-site, crushing the building debris, spreading the debris across the site, and covering the fill with a cap. Slab foundations will remain in place. Building debris will be sampled to determine if it is RCRA characteristic hazardous waste or non-hazardous, and to determine if PCB contamination is present and the concentration. Non-hazardous debris with PCB concentrations < 1 ppm will be spread across the northern and western portions of the site and capped with a vegetative cover. However, it should be noted that this vegetative cap may not be required depending on the planned redevelopment actions (see Section 5.3.3 for potential cost savings).

Hazardous debris with PCB concentrations > 1 ppm and < 50 ppm will be spread across the southern portion of the site under EPA's Area of Contamination (AOC) policy and will include the Maintenance

Building and Building 4 slab foundations. This portion of the site would be restricted to low occupancy use only, requiring post-removal site controls. The southern portion of the site where hazardous waste is consolidated will be covered with a prescriptive cap following guidelines from EPA's "Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments" (EPA 1989) and EPA's "(Draft) Technical Guidance for RCRA/CERCLA Final Covers" (EPA 2004). The AOC policy allows that certain discrete areas of generally dispersed contamination may be considered RCRA landfills and would not typically constitute a new act of treatment, storage, or disposal that triggers additional RCRA requirements, like LDRs. Hazardous waste debris or debris that contain PCB concentrations > 50 ppm will be disposed of off-site in accordance with 40 CFR § 761. Metal building materials, ACM, and PCB-contaminated insulation will be removed prior to demolition activities.

Assumptions for Alternative 3 are as follows:

1. Collection of an estimated 100 samples is anticipated during the Asbestos Survey. Costs for this survey and report were estimated by application of the "RCRA Facility Investigation" technology in RACER. Cost items were removed that did not apply.
2. Roofing tar and boiler/piping insulation contain asbestos, and will be abated prior to demolition of buildings. This will be classified as ACM and disposed of off site as special waste. This includes roofing at the Production Building and Buildings 1, 2, and 3; and boiler/piping insulation at Building 1.
3. The insulation at the Production Building and Buildings 1, 2, and 3 is presumed to contain PCBs and will be removed prior to demolition of buildings and disposed of in accordance with 40 CFR § 761. Due to the additional restrictions associated with PCB disposal in Iowa, disposal will also be based on concentration. Insulation and material with PCB concentrations > 50 ppm will be disposed of as bulk product waste at a TSCA-approved landfill.
4. The Production Building is assumed to have no contamination that can be classified as hazardous waste, with the exception of PCBs in insulation and asbestos defined above.
5. The Maintenance Building and Building 4 foundations contain RCRA listed waste and will remain in place on site under a prescriptive cap.
6. All slab foundations will remain in place.
7. During demolition activities, metal materials (i.e., rebar, steel beams, etc.) will be separated and decontaminated as necessary. Metals will be recycled at a local scrap yard. It is assumed that the scrap yard will pay \$90 per ton of metal based on current prices as of February 16, 2017. Residue from decontamination procedures determined to contain PCBs will be disposed of as PCB remediation waste.

8. For the purpose of this EE/CA, the following assumptions were made regarding the amount of metal within the structures on site:

Structure	Construction Material	Percent of Structure that Contains Metal
Production Building (76%)	Masonry	10%
Production Building (24 %)	Steel	100%
Building 1	Masonry	10%
Building 2	Masonry	10%
Building 3	Steel	100%
Walkway	Steel	100%

These assumptions are based on review of available photographs of the structures.

9. Demolition debris remaining following the above activities will be sampled to determine the concentration of any PCBs and whether the materials are classified as a RCRA characteristic waste. These sampling results will determine appropriate disposal methods and locations. Based on June 2016 sampling of building debris, 30% of the remaining demolition debris is assumed to contain PCBs > 1 ppm and < 50 ppm, and will be spread across the southern portion of the site under the prescriptive cap. Of the remaining demolition debris, 25 to 75% is assumed to be hazardous RCRA characteristic waste.
10. Crushed materials will be spread on site and capped. Demolition debris determined to be hazardous will be spread on the southern portion of the site including the area where the foundations remain for the Maintenance Building and Building 4. This portion of the site would be restricted to low occupancy use only. The prescriptive cap will encompass 4 acres and include 2 feet of low permeability clay, 60/1,000-inch (60 mil) high-density polyethylene (HDPE) liner, drainage netting, 36-inch protection layer, 12 inches of top soil, and a vegetative cover. To meet the guidelines for the maximum permeability of clay, 2% sodium bentonite would be added to the clay layer. The non-hazardous demolition debris with PCB concentrations < 1 ppm will be spread across the northern and western portions of the site, and covered with a vegetative cap encompassing 13.4 acres. The vegetative cap will consist of 18 inches of soil (6 inches each of clay, fill, and topsoil) and vegetation that will be placed directly over the demolition debris.
11. Demolition equipment will require decontamination. Equipment decontamination operations are anticipated to last 1 week. Costs include construction of a decontamination facility pad and disposal of wash water.
12. Disposal of PCB wastes will occur at a TSCA-approved landfill. Transportation by rail and disposal charges will be \$282.81 per ton, based on estimates received from disposal facilities.
13. The volume to weight conversion factor for construction and demolition waste is 0.625 tons per cubic yard based on KDHE Bureau of Waste Management (KDHE 2010). An Iowa-specific weight conversion was not found.
14. No soil will be removed as part of this alternative.
15. LDRs are applicable as appropriate.

5.0 ANALYSIS OF REMOVAL ACTION ALTERNATIVES

This section evaluates removal action alternatives applying the three broad evaluation criteria identified in EPA's Guidance on Conducting Non-Time-Critical Removal Actions under CERCLA (EPA 1993a). These include effectiveness, implementability, and cost. State acceptance and community acceptance will be evaluated after receipt of public comment.

5.1 ALTERNATIVE 1 – NO ACTION (BASELINE)

The No Action alternative is required by the NCP and will serve as a comparative reference for other removal action alternatives.

5.1.1 Effectiveness

This section evaluates the effectiveness of Alternative 1 and its ability to meet the objective within the scope of the removal action.

Due to changing land use and the 2013 5-year review, an Ecological Risk Assessment (EPA 2015) and an updated HHRA (Tetra Tech 2017) were performed. The HHRA addendum identified unacceptable risk to human receptors. The changing land use of the site by its rezoning from industrial to mixed use requires the demolition of contaminated on-site buildings. Potentially toxic and hazardous substances within the buildings and slab foundations present an actual or potential exposure to human health and the environment. However, risk from contaminated building materials could not be evaluated because there are no published or site-specific risk-based screening levels for building materials. Alternative 1 would not be effective in the long term for anticipated future land use, and would not be a permanent remedy. Potential risk posed by contaminated building materials would remain unmitigated. Alternative 1 does not include treatment and would therefore not reduce toxicity, mobility, or volume through treatment. Alternative 1 would not provide any short-term effectiveness. Therefore, Alternative 1 is no longer protective of human health or the environment.

5.1.2 Implementability

This section evaluates the implementability of Alternative 1 including technical and administrative feasibility and availability of the various services and materials required to implement the removal action.

Alternative 1 would require no effort to implement and would not require availability of services and materials as it is the current remedy for the site. However, Alternative 1 would face administrative

hurdles, because it no longer addresses risk due to the anticipated future use. Potential administrative hurdles would include EPA acceptance of this alternative, updating the current ROD, and 5-year reviews.

5.1.3 Cost

There is no cost associated with Alternative 1.

5.2 ALTERNATIVE 2 – BUILDING DEMOLITION WITH OFF-SITE DISPOSAL

Alternative 2 involves removal of building materials, including contaminated materials that contain a RCRA characteristic or listed waste. PCB contaminated insulation and material with PCB concentrations > 50 ppm would be removed from the buildings and disposed of according to 40 CFR § 761 and Iowa regulations. All hazardous and non-hazardous waste would be transported to off-site landfills.

5.2.1 Effectiveness

This section evaluates the effectiveness of Alternative 2 in its ability to meet the objective within the scope of the removal action.

Alternative 2 rates high under this criterion and has a high degree of permanence. This alternative permanently reduces long-term risk to human receptors and—if risk posed by soil contamination is within an acceptable risk range or it is capped to prevent exposure—it restores the area occupied by buildings for anticipated future use. Building materials that pose a risk would be removed and permanently eliminated by demolition and disposal off site. This would reduce the volume of contaminants at the source through disposal in a secure and regulated landfill. Some of the material may also require treatment before disposal, which would reduce toxicity of the material. Contaminated soil that might pose a risk after building demolition would be mitigated indirectly through the implementation of a cap. Since contamination would remain on site, groundwater monitoring would be required. Groundwater monitoring and treatment are ongoing as part of the current ROD for OU1 (EPA 1986).

Alternative 2 would have moderate short-term effectiveness. Some risk to workers and the community would be posed during building demolition. Risk to workers would be mitigated through safe work practices, including use of personal protective equipment, dust suppression, and air monitoring. Potential for spill of contaminated material, and increased potential for vehicle collisions due to construction traffic, would be the primary risks to the community.

Alternative 2 would comply with ARARs.

5.2.2 Implementability

This section evaluates the implementability of Alternative 2 including technical and administrative feasibility and availability of the various services and materials required to implement the removal action.

Alternative 2 would have high implementability and is highly feasible. Technologies and skills necessary to implement the remedy would be readily available. Buildings and foundations could be demolished, crushed, or cut to required sizes and removed with reasonable accuracy. Materials, services, and equipment necessary for implementation of Alternative 2 are readily, commercially available. Disposal facilities are also readily available and have adequate capacity for the volumes of material being removed. Building demolitions, and removal and placement of fill and a cap are expected to take 3 months.

5.2.3 Cost

The cost of Alternative 2 in 2017 dollars is estimated to be between \$11,127,000 and \$12,846,000 depending on the amount of demolition debris determined to be hazardous. The estimated cost is sensitive to the volume of building material that must be removed off site and the quantity of building material determined to be hazardous due to RCRA characteristic or listed waste. The Production Building could be addressed under a separate action outside of the EE/CA as it was not part of the 1996 ROD. If the Production Building is not addressed under this EE/CA, the cost of Alternative 2 would be approximately \$5,901,000 less, resulting in a total cost between \$5,226,000 and \$6,945,000 for Alternative 2. A breakdown of the cost for the Production Building alone is presented in Appendix C. Details of cost assumptions are presented in Appendix B.

Potential cost savings associated with this alternative are as follows:

- ☐ A vegetative cap may not be required if soil samples are collected from the areas previously hosting the buildings and slab foundations and it is verified that levels of COCs do not exceed action levels or if the timing of redevelopment would provide sufficient cover. This would result in a total potential cost savings of approximately \$1,905,000, resulting in a total cost of between \$9,222,000 and \$10,941,000 depending on the amount of demolition debris determined to be hazardous. Details of cost assumptions are presented in Appendix D.
- ☐ Depending on redevelopment of the site, all slab foundations could remain in place. This would result in a total potential cost savings of approximately \$3,329,000 to \$4,031,000, resulting in a total cost of between \$7,798,000 and \$8,815,000 depending on the amount of demolition debris determined to be hazardous. Details of cost assumptions are presented in Appendix D.
- ☐ Depending on redevelopment of the site, building foundations could remain in place for the portions of the site in which the building structures have already been removed (i.e., portions of Production Building, Maintenance Building, and Buildings 3, 4, and 5). This would result in a

total potential cost savings of approximately \$2,428,000 to \$2,559,000, resulting in a total cost of between \$8,699,000 and \$10,287,000 depending on the amount of demolition debris determined to be hazardous. Details of cost assumptions are presented in Appendix D.

- Non-hazardous demolition debris with PCB concentrations < 1 ppm could potentially be disposed of on-site in the form of a berm along the edge of the property, approximately 3,615 feet in length. The berm would be approximately 4.5 feet high and would include 3 feet of debris, 18 inches of soil (6 inches each of clay, fill, and topsoil), and a vegetative cover. The berm would be approximately 101 to 110 feet wide, depending on the volume of non-hazardous debris, with a concrete sidewalk, 10 feet wide, for use as a walking path. This alternative provides another option, but does not provide significant cost savings. This alternative would result in a potential cost savings of approximately \$232,000 if 25% of the building debris is non-hazardous and \$350,000 if 75% of the building debris is non-hazardous, resulting in a total cost of between \$10,777,000 and \$12,614,000 depending on the amount of demolition debris determined to be hazardous. Potential additional costs such as drainage design and permitting have not been included. Details of cost assumptions are presented in Appendix D.

5.3 ALTERNATIVE 3 – BUILDING DEMOLITION WITH ON-SITE CONTAINMENT

Alternative 3 involves demolishing the buildings, crushing building debris, and leaving it on site. PCB contaminated insulation and material with PCB concentrations > 50 ppm would be removed from the buildings and disposed of according to 40 CFR 761 and Iowa regulations. All slab foundations would remain in place. Demolition debris determined to be non-hazardous and containing PCB concentrations < 1 ppm would be placed in the northern and western portions of the site and overlain by a vegetative cap, if needed (see Figures 7 and 8). The vegetative cap would encompass 13.4 acres and consist of 18 inches of soil (6 inches each of clay, fill, and topsoil) and vegetation. Approximately 1.6 to 1.8 feet of demolition debris would be used as a foundation layer, depending on the quantity of non-hazardous waste with PCB concentrations < 1 ppm (25-75%). Demolition debris determined to be hazardous and containing PCB concentrations < 50 ppm would be placed in the southern portion of the site and overlain by a RCRA-compliant cap that would consist of 2 feet of low permeability clay, 60-mil HDPE liner, drainage netting, 36-inch protection layer, 12 inches of top soil, and a vegetative cover (see Figures 7 and 8). This cap would encompass 4 acres and would include approximately 0.8 to 1.4 feet of demolition debris as a foundation layer, depending on the quantity of hazardous waste (25-75%). This portion of the site would be restricted to low occupancy use only, requiring post-removal site controls.

5.3.1 Effectiveness

This section evaluates the effectiveness of Alternative 3 in its ability to meet the objective within the scope of the removal action.

Alternative 3 rates moderate to high under this criterion. This alternative reduces long-term risk to human receptors by burying contaminated building materials under clean fill, isolating it from the environment and human receptors. It is unlikely that natural processes could uncover buried contaminated building material. However, since contaminants in building materials would be contained on site rather than removed and the caps would erode and settle over time, the alternative would require maintenance of the cap and implementation of post-removal site controls to remain protective.

Since contamination would remain on site, groundwater monitoring would be required. Groundwater monitoring and treatment are ongoing as part of the current ROD for OU1 (EPA 1986). As indicated by this monitoring, pesticide contamination in soil and fill below the buildings has not migrated to groundwater over the last few decades. The RCRA-compliant caps would limit infiltration of water through contaminated building materials. Leaching from building debris to groundwater is unlikely unless groundwater rises substantially. This alternative would protect groundwater in the long term.

Alternative 3 does not involve treatment and therefore would not reduce toxicity, mobility, or volume of contaminants through treatment.

Alternative 3 rates moderate to high for short-term effectiveness. Potential for exposure of workers or the community to contaminated building materials would be small because most material would be left on site. There would be some potential for community exposure when asbestos, PCBs, and metals are removed from the site for disposal/recycling. Increased risk of vehicular collisions would be posed because of construction traffic, removal of some building material, and transport of clean fill and seeding to the site.

Alternative 3 would comply with ARARs.

5.3.2 Implementability

This section evaluates the implementability of Alternative 3 including technical and administrative feasibility and availability of the various services and materials required to implement the removal action.

Alternative 3 rates moderately high for implementability and the availability of materials, services, and equipment necessary for its implementation. The remedy is straightforward, but may require specialized equipment to crush building debris. It would take approximately 4 months to implement. Alternative 3 involves demolishing buildings, removing metals, crushing concrete for fill, and installing RCRA-compliant caps.

Although Alternative 3 is feasible, and since contamination will be left on site, redevelopment of the site would be limited. Land use in the surrounding area is changing, and much of this area has been rezoned since the remedy was selected for OU2 and OU4 in the 1996 ROD. The City of Des Moines is planning on conducting a major redevelopment project in the River Point West area east of the site.

5.3.3 Cost

The cost of Alternative 3 in 2017 dollars is estimated at \$13,939,000. The estimated cost is sensitive to the design of the cap. The location of the on-site disposal may vary from that depicted in Figures 7 and 8 due to redevelopment. However, any costs associated with changing the location of the disposal would be the responsibility of the future developer. The Production Building could be addressed under a separate action outside of the EE/CA as it was not part of the 1996 ROD. If the Production Building is not addressed under this EE/CA, the cost of Alternative 3 would be approximately \$4,606,000 less, resulting in a total cost of approximately \$9,333,000 for Alternative 3. A breakdown of the cost for the Production Building alone is presented in Appendix C. Details of cost assumptions are presented in Appendix B.

Potential cost savings associated with this alternative are as follows:

- A vegetative cap may not be required for non-hazardous debris if redevelopment of the site is to occur immediately following demolition activities. This would result in a potential cost savings of approximately \$3,620,000, resulting in a total cost of \$10,319,000. Details of cost assumptions are presented in Appendix D.
- Non-hazardous demolition debris with PCB concentrations < 1 ppm could potentially be disposed of on-site in the form of a berm along the edge of the property, approximately 3,615 feet in length. The berm would be approximately 4.5 feet high and would include 3 feet of debris, 18 inches of soil (6 inches each of clay, fill, and topsoil), and a vegetative cover. The berm would be approximately 90 feet wide with a concrete sidewalk, 10 feet wide, for use as a walking path. A small vegetative cap, approximately 2.3 acres in size would still be required to cover the slab foundations of Buildings 1, 2, and 3. This alternative would result in a total potential cost savings of approximately \$582,000, resulting in a total cost of about \$13,357,000. Potential additional costs such as drainage design and permitting have not been included. Details of cost assumptions are presented in Appendix D.

6.0 COMPARATIVE ANALYSIS OF REMOVAL ACTION ALTERNATIVES

Tetra Tech compared the three removal action alternatives detailed in Section 5.0 according to three broad criteria defined in EPA's Guidance on Conducting Non-Time-Critical Removal Actions under CERCLA (EPA 1993a):

1. Effectiveness
2. Implementability
3. Cost

The results are summarized in Table 1.

TABLE 1
SUMMARY OF FEASIBILITY OPTIONS

Screening Criteria	Alt. 1: No Action	Alt. 2: Building Demo with Off-site Disposal	Alt. 3: Building Demo with On-site Containment
1. Effectiveness	Not effective	Yes. Moderate to High	Yes. Moderate to High
2. Implementability	Yes. Nothing required to implement; however would likely face administrative hurdles.	Yes. High	Yes. Moderate to High
3. Cost	No cost	\$11,127,000 to \$12,846,000	\$13,939,000

Note:

Costs do not include potential cost savings discussed in Sections 5.2.3 and 5.3.3.

The Production Building could be addressed under a separate action outside of the EE/CA as it was not part of the 1996 ROD. If the Production Building is not addressed under this EE/CA, the cost of Alternative 2 would be approximately \$5,901,000 less, and the cost of Alternative 3 would be approximately \$4,606,000 less. A breakdown of the cost for the Production Building alone is presented in Appendix C.

Potential cost savings for Alternative 2, building demolition with off-site disposal, and Alternative 3, building demolition with on-site containment, are shown in Tables 2 and 3 below, respectively, and in Figure 9.

TABLE 2**SUMMARY OF POTENTIAL COST SAVINGS FOR ALTERNATIVE 2**

Option	Potential Cost Savings	Total Cost
No Cap Required	\$1,905,000	\$9,222,000 to \$10,941,000
Leave All Slab Foundations in Place	\$3,329,000 to \$4,031,000	\$7,798,000 to \$8,815,000
Leave Slab Foundations in Place for Portions of Production Building, Maintenance Building, and Buildings 3, 4, and 5	\$2,428,000 to \$2,559,000	\$8,699,000 to \$10,287,000
Dispose of Non-hazardous Waste in Berm	\$232,000 to \$350,000	\$10,777,000 to \$12,614,000

Note:

EE/CA Engineering Evaluation/Cost Analysis

TABLE 3**SUMMARY OF POTENTIAL COST SAVINGS FOR ALTERNATIVE 3**

Option	Potential Cost Savings	Total Cost
No Cap Required	\$3,620,000	\$10,319,000
Dispose of Non-hazardous Waste in Berm	\$582,000	\$13,357,000

Note:

EE/CA Engineering Evaluation/Cost Analysis

Based on results of this EE/CA, No Action (Alternative 1) is not effective because it does not actively seek to reduce or eliminate potential risk to human health and the environment based on changes in land use and potential for future development of the site.

Building demolition with on-site containment (Alternative 3) satisfies most of the criteria, but is the most expensive and does not reduce the volume of contamination on site as much as Alternative 2. In addition, Alternative 3 limits the use of the site, as the prescriptive cap would allow for low occupancy use only. Building demolition with off-site disposal (Alternative 2) satisfies more of the criteria, including reducing the volume of contamination on site and potentially reducing the toxicity of COCs, and is less expensive than Alternative 3.

Details of cost assumptions are presented in Appendix B. Figures 6, 7, and 8 show conceptual models of the removal action alternatives—Alternatives 2 and 3. State and community acceptance will be evaluated following the public comment period.

7.0 RECOMMENDED REMOVAL ACTION ALTERNATIVE

Tetra Tech was tasked by EPA under EPA START 4 Contract No. EP-S7-13-06, Task Order No. 0144 to prepare an EE/CA for removal of buildings and foundations at the Des Moines TCE site. The site is in south-central Des Moines on the east side of the Raccoon River. The property is owned by Dico, and contamination at the site resulted mainly from Dico's operations over 40 years that included steel wheel manufacturing, and chemical and pesticide formulation.

Pesticides detected in the Maintenance Building and Building 4 are RCRA listed wastes because of Dico's previous regulated activities of pesticide formulation.

Tetra Tech evaluated three removal action alternatives: (1) "No Action," which is the baseline alternative; (2) removing all building materials, with the debris sent offsite to a regulated disposal facility; and (3) demolishing the buildings, crushing all building debris that would then be left on site, spreading the material across the site, and covering the fill with a cap. Details of these removal action alternatives are presented in Section 4.0. Removal action alternatives were compared to three screening criteria in Section 5.0.

Based on results of this EE/CA, No Action (Alternative 1) no longer complies with many of the three criteria because it does not actively protect human health and the environment based on changes in anticipated future land use. It is the most cost effective alternative because nothing would be implemented beyond what has already been put in place as a result of the 1996 ROD.

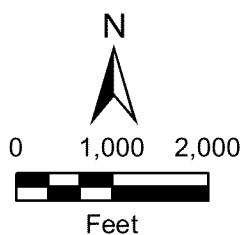
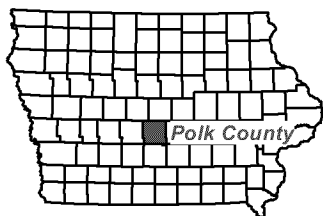
Building demolition with on-site containment (Alternative 3) satisfies many of the criteria, but is the most expensive. Building demolition with off-site disposal (Alternative 2) satisfies more of the criteria, including reducing the volume of contamination on site and toxicity of COCs, and is less expensive than Alternative 3.

EPA's preferred alternative for addressing contamination within buildings is Alternative 2, Building Demolition with Off-site Disposal, and includes demolishing buildings and slab foundations, disposing of any hazardous debris at an off-site landfill, and capping exposed soil with a vegetative cover, depending on potential unacceptable risk from site soils and redevelopment plans. The cost for this option is estimated to be between \$11,127,000 and \$12,846,000 depending on the amount of demolition debris determined to be hazardous and the need for the vegetative cover. This alternative achieves substantial risk reduction and addresses the buildings as a source of contamination at the site. The proposed non-time critical removal action will be consistent with the final remedy for the site.

8.0 REFERENCES

- Black & Veatch Special Projects Corp. 1996. Final Feasibility Study for the Des Moines TCE Site Operable Unit Nos. 2 and 4, Des Moines, Iowa. May 30.
- Eckenfelder Inc. 1992. Des Moines South Pond/Drainage Area; Source Control Operable Unit (Operable Unit No. 4); Building Sampling, Analyses, and Engineering Evaluation Report. August.
- Kansas Department of Health and Environment (KDHE). 2010. Bureau of Waste Management Policy 10-02 related to Construction and Demolition Waste: Volume to Weight Conversion Factor. April.
- Tetra Tech, Inc. (Tetra Tech). 2017. Supplemental Remedial Investigation Report, Des Moines TCE Site OU2 and OU4, Des Moines, Iowa, Risk Assessment Addendum. January.
- U.S. Environmental Protection Agency (EPA). 1986. Superfund Record of Decision: Des Moines TCE, IA. EPA/ROD/R07-86/005. July 21.
- EPA. 1989. Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments. EPA 530-SW-89-047. July.
- EPA. 1992. Superfund Record of Decision: Des Moines TCE, IA. EPA/ROD/R07-92/057. September 18.
- EPA. 1993a. Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA. EPA540-R-93-057, OSWER 9360.0-32. August.
- EPA. 1993b. Response Actions at Sites with Contamination Inside Buildings. OSWER Directive 9360.3-12. August.
- EPA. 1996. EPA Superfund Record of Decision: Des Moines TCE, EPA ID: IAD980687933, OU 02, 04, Des Moines, IA. December.
- EPA. 2000. Use of Non-Time-Critical Removal Authority in Superfund Response Actions. February 14.
- EPA. 2004. (Draft) Technical Guidance for RCRA/CERCLA Final Covers. EPA 540-R-04-007, OSWER 9283.1-26. April.
- EPA. 2012. Fact Sheet. Fifth Five-Year Review to Begin, Des Moines TCE Superfund Site, Des Moines, Polk County, Iowa. February.
https://archive.epa.gov/region07/factsheets/web/html/5th_five_yr_des_moines_tce_sprfnd_des_moiness_ia.html
- EPA. 2012. PCB Bulk Product Waste Reinterpretation. Office of Resource Conservation and Recovery. October 24.
- EPA. 2013. Fifth Five Year Review Report, Des Moines TCE Superfund Site, Des Moines, Polk, County, Iowa. April 9.
- EPA. 2015. Ecological Risk Assessment for Des Moines TCE Site, Operable Unit 04. October.
- EPA. 2016. Addendum to Des Moines TCE Site Five-Year Review Report, dated April 9, 2013. July.

FIGURES



Des Moines TCE Site
Des Moines, Iowa

Figure 1
Site Location Map

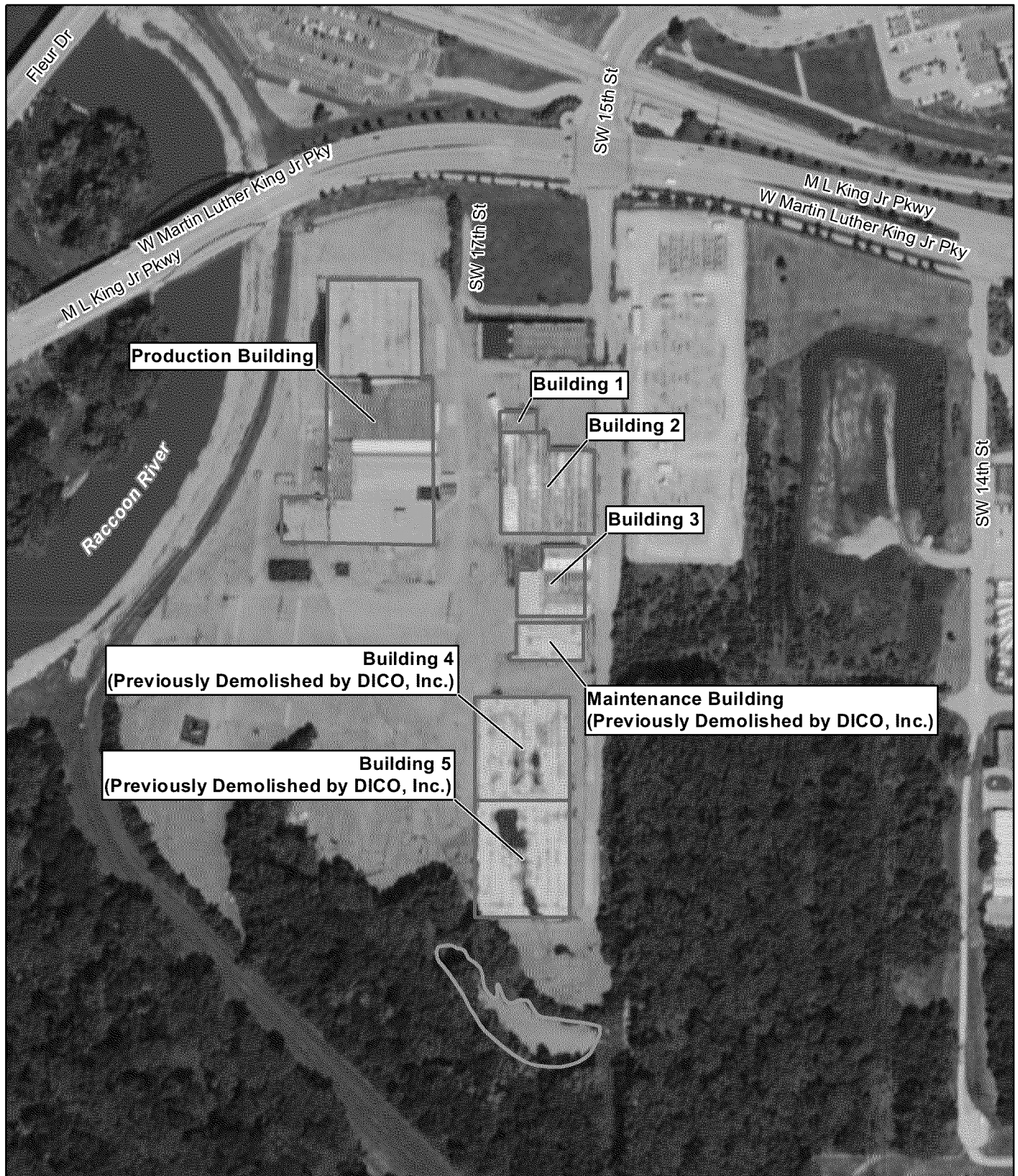


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USGS Des Moines SE, IA 7.5 Minute Topo Quad, 1976



Date: 9/29/2016

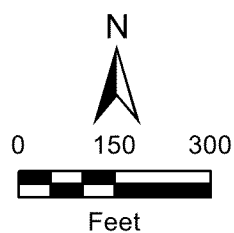
Drawn By: Nick Wiederholt

Project No: X9025.16.0144.000



Legend

-  Building location
-  South pond area



Des Moines TCE Site
Des Moines, Iowa

Figure 2
Site Layout Map



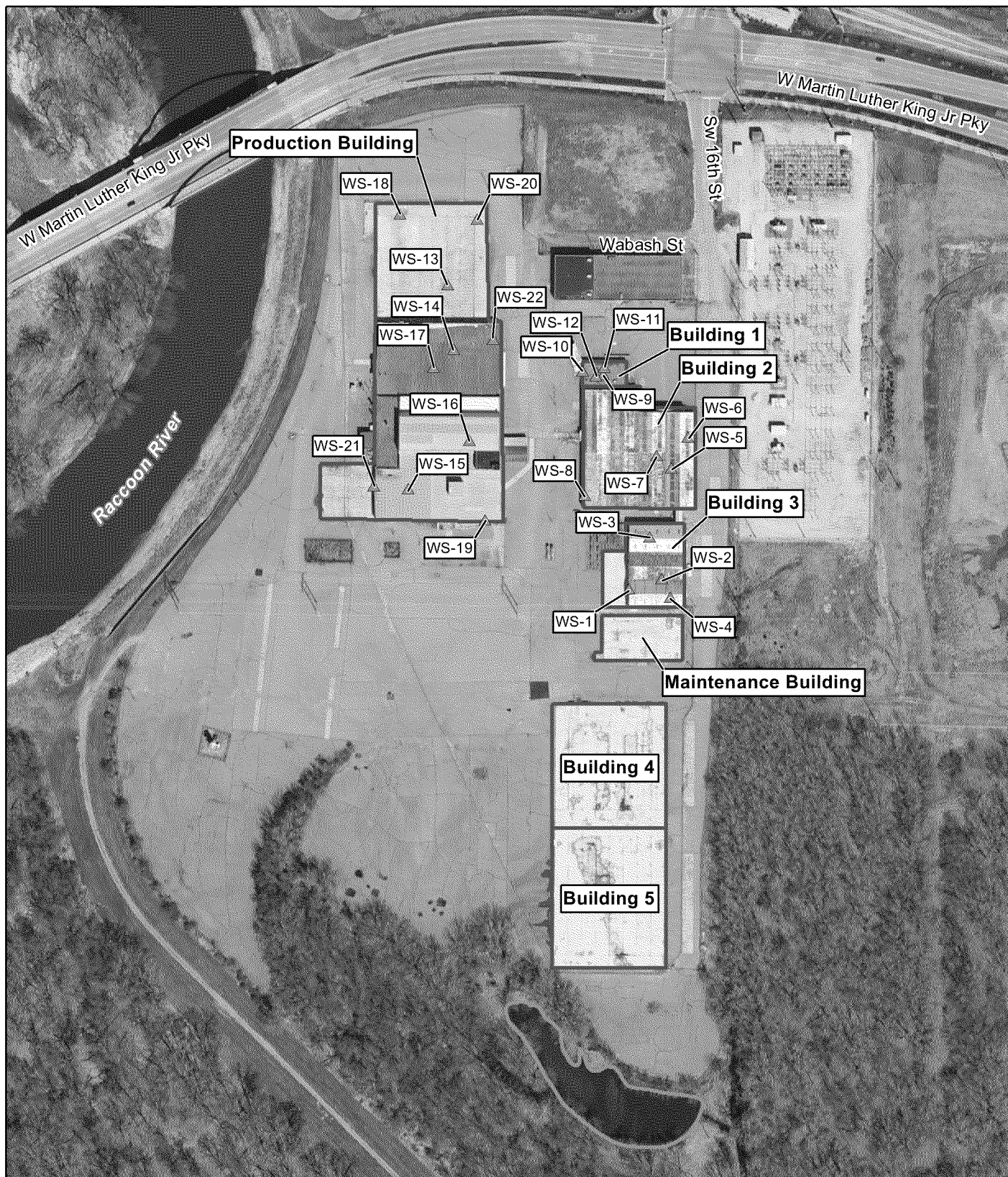
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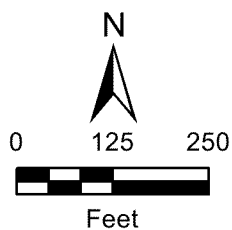
Drawn By: Nick Wiederholt

Project No: X9025.16.0144.000



Legend

- ▲ Wipe sample location
- Building location
- South pond area
- WS Wipe sample



Des Moines TCE Site
Des Moines, Iowa

Figure 3
Wipe Sample Location Map



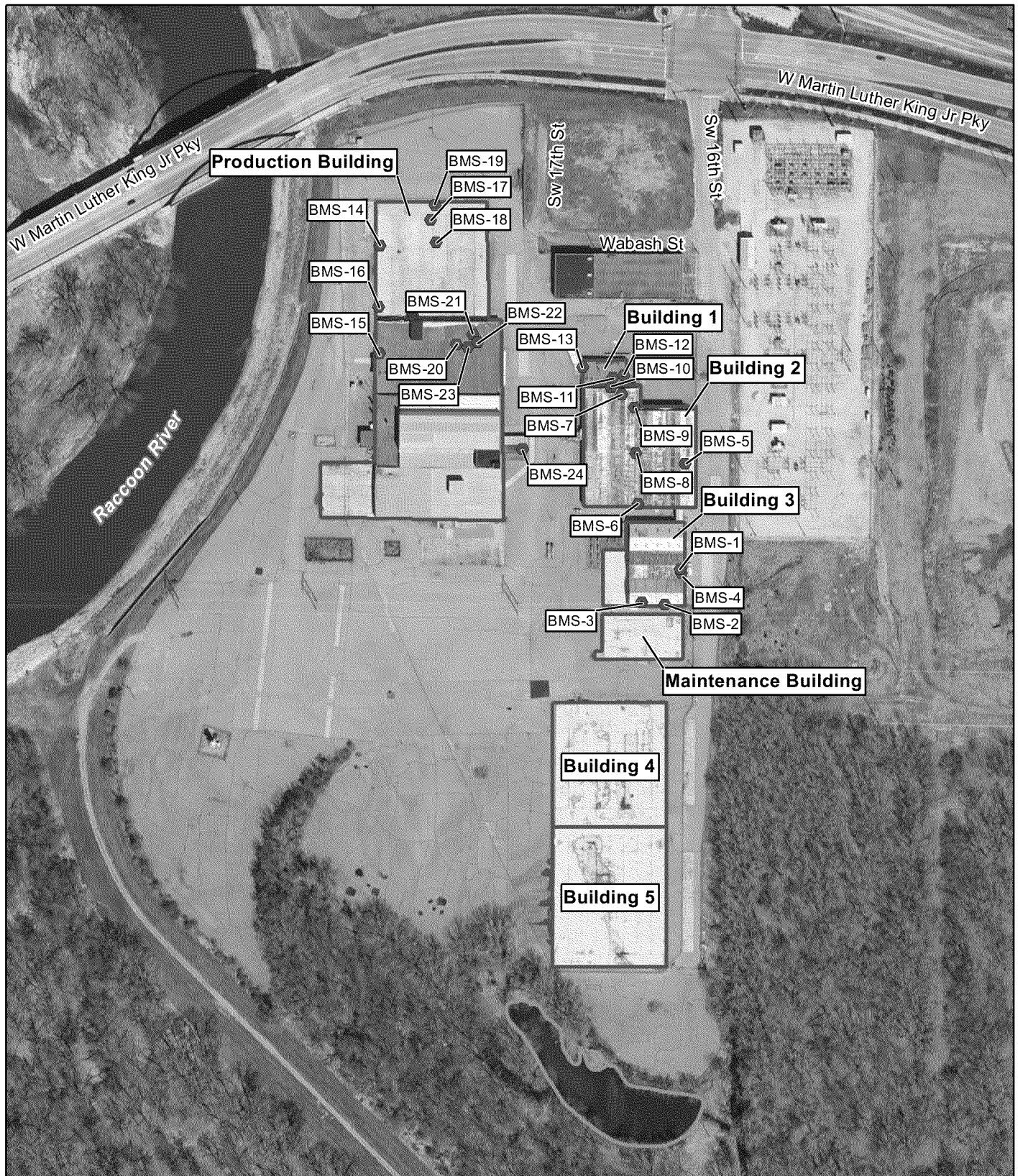
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Date: 8/1/2017

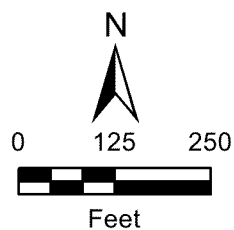
Drawn By: Nick Wiederholt

Project No: X9025.16.0144.000



Legend

- Building material sample location
- ▭ Building location
- ▭ South pond area
- BMS Building material sample



Des Moines TCE Site
Des Moines, Iowa

Figure 4
Building Material Sample Location Map



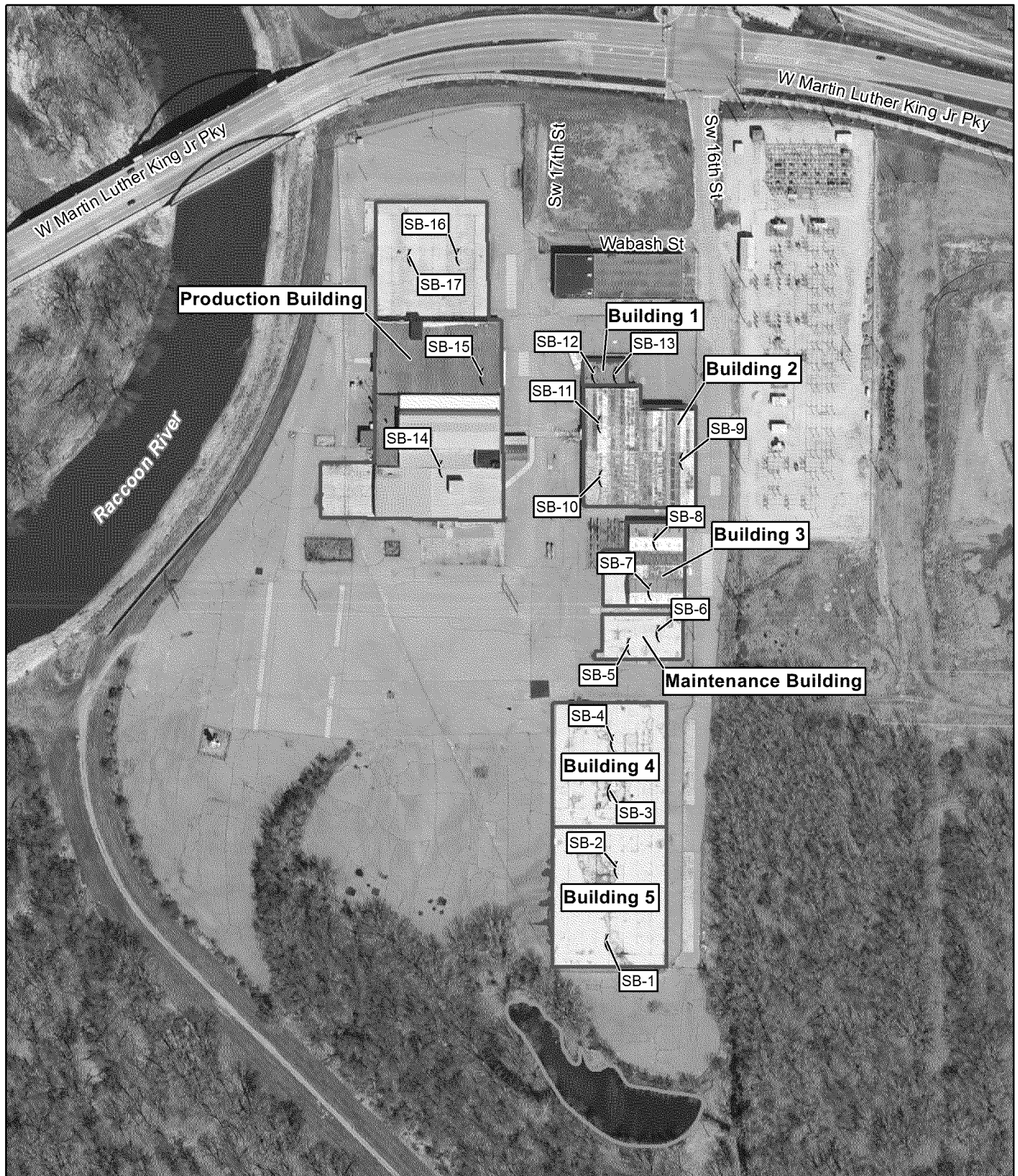
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Date: 8/1/2017

Drawn By: Nick Wiederholt

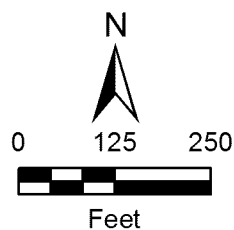
Project No: X9025.16.0144.000



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Legend

- () Concrete/sub-slab soil sample location
- [] Building location
- [] South pond area
- SB Soil boring



Source: ESRI, ArcGIS Online Maps, World Imagery, 2014; HSIP Gold, 2007

Des Moines TCE Site
Des Moines, Iowa

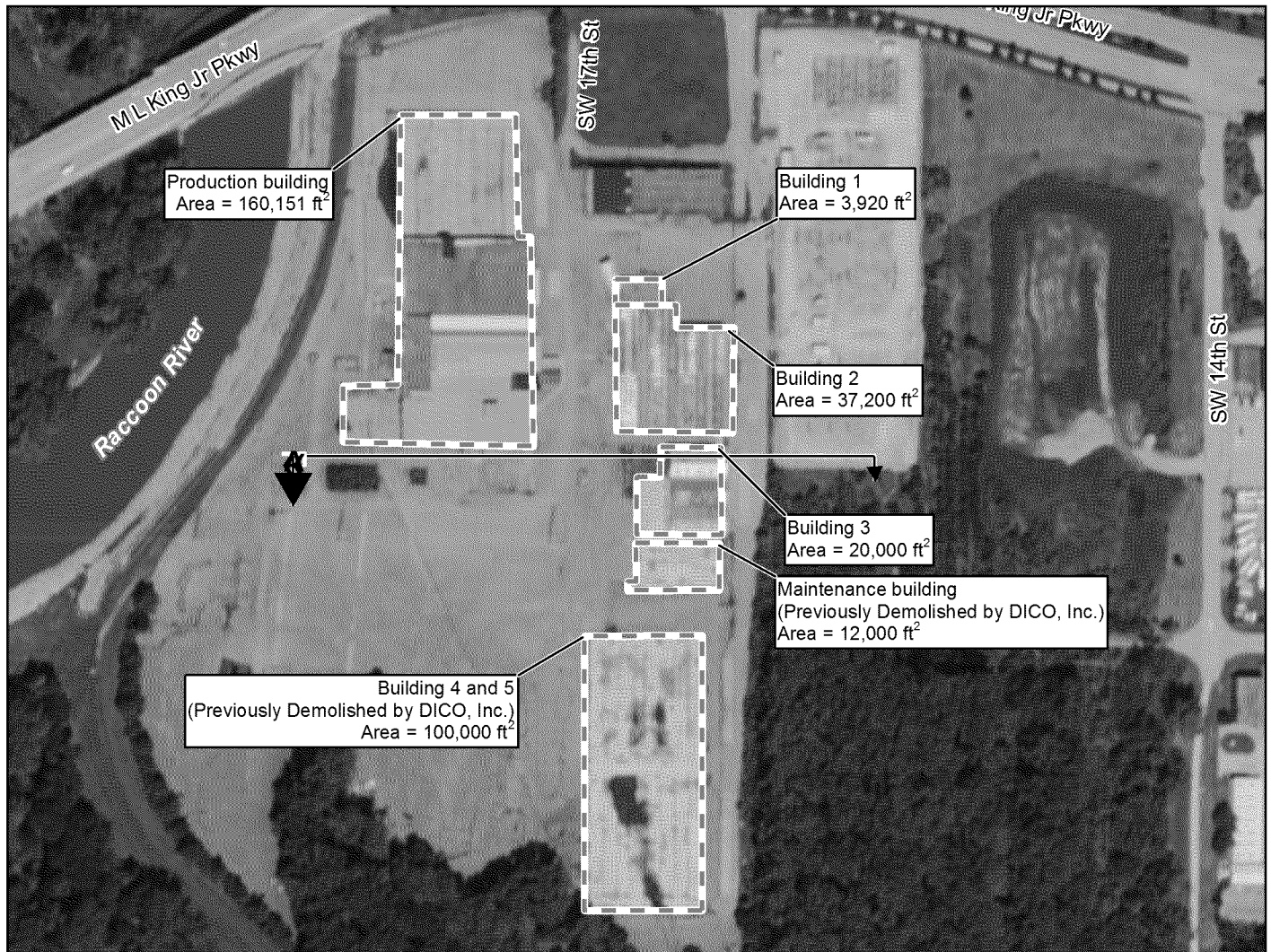
Figure 5 Concrete Sample Location Map



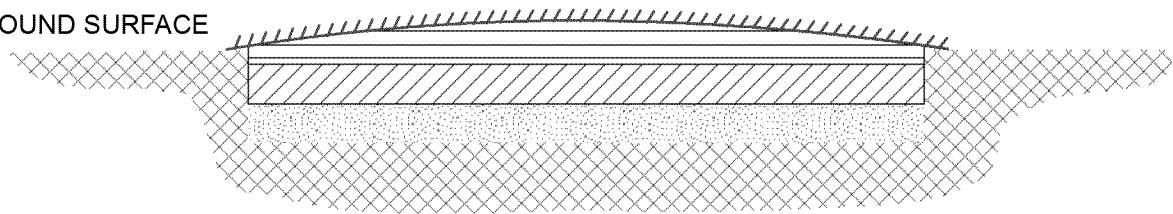
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Drawn By: Nick Wiederholt

Project No: X9025.16.0144.000



GROUND SURFACE

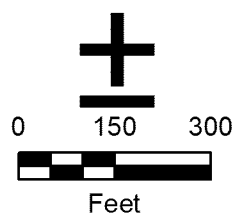


SECTION A
NOT TO SCALE

Legend

- Seeding, vegetative cover
- Topsoil (6 inches)
- Fill (6 inches)
- Clay (6 inches)
- Native soil
- Footprint of building demolition

ft² Square feet



Des Moines TCE Site
Des Moines, Iowa

Figure 6
Alternative 2 - Building Demolition with Off-Site
Disposal Cross-Section



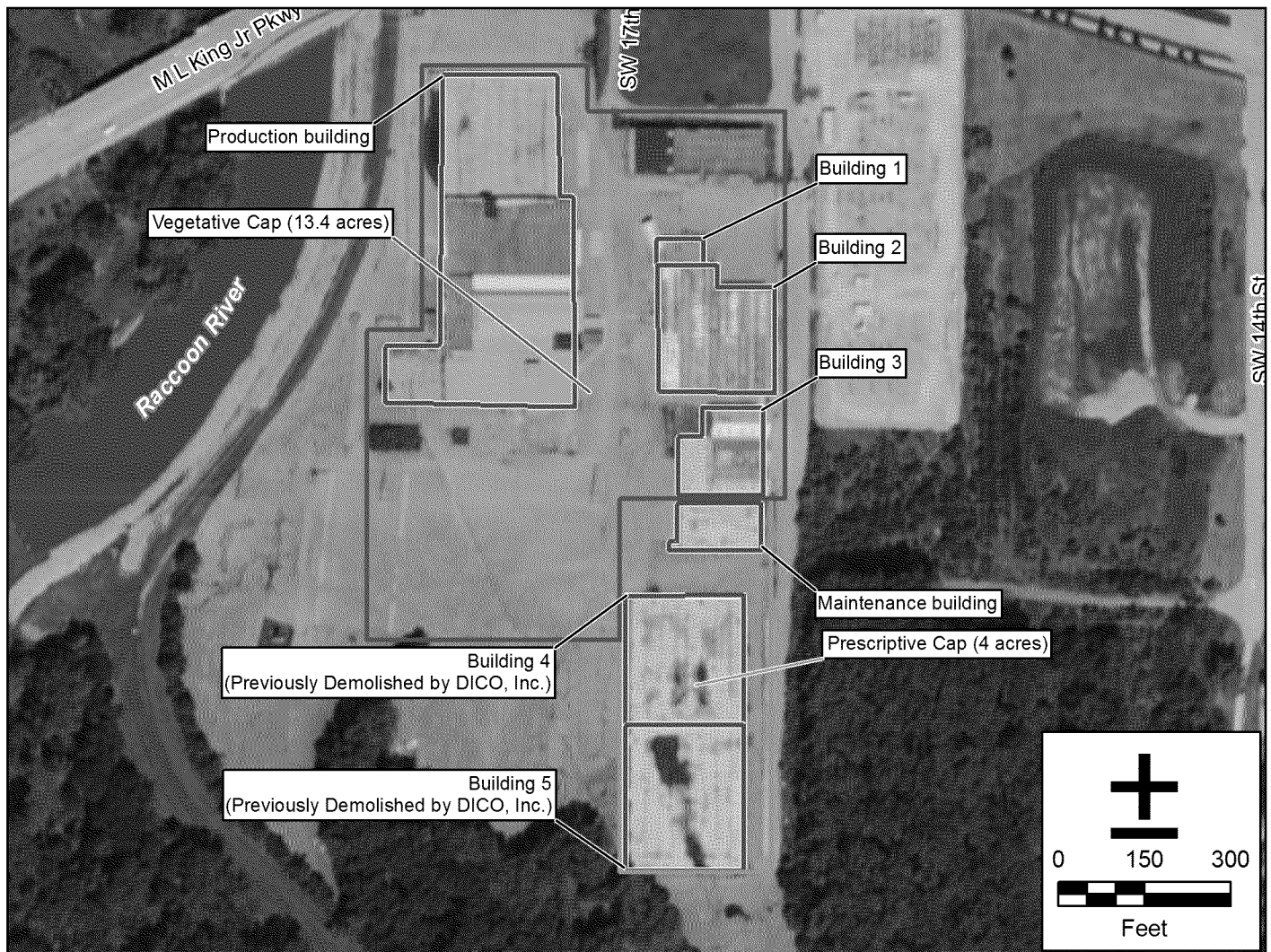
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Drawn By: Clayton Hayes

Project No: X9025.16.0144.000

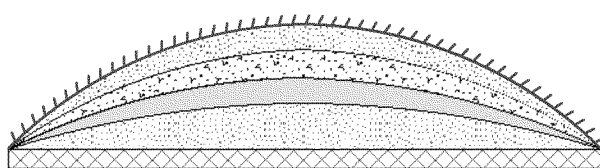
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Source: ESRI, ArcGIS Online Maps, World Imagery, 2014; HSIP Gold, 2007



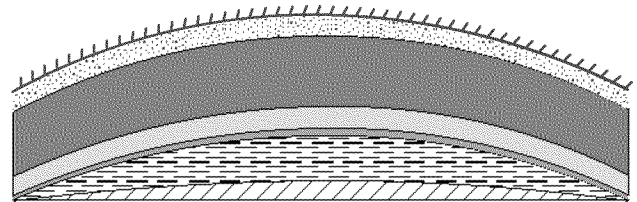
SECTION A: BUILDING DEMOLITION WITH ON-SITE CONTAINMENT (25% HAZARDOUS)

VEGETATIVE CAP



NOT TO SCALE

PRESCRIPTIVE CAP



NOT TO SCALE

Legend

- | | |
|---|---------------------------------------|
| Vegetative cover | Prescriptive Cap |
| Footprint of building | Topsoil (12 inches) |
| Proposed Asphalt Cap | Protective layer (36 inches) |
| Proposed Prescriptive Cap | Drainage netting |
| Vegetative Cap | HDPE liner (60 millimeters) |
| Topsoil (6 inches) | Clay (2 feet) |
| Fill (6 inches) | Hazardous building debris (~0.8 feet) |
| Clay (6 inches) | ~ Approximate |
| Non-hazardous building debris (~1.8 feet) | |
| Existing asphalt/concrete | |

Source: ESRI, ArcGIS Online Maps, World Imagery, 2014; HSIP Gold, 2007

Des Moines TCE Site
Des Moines, Iowa

Figure 7

Alternative 3 - Building Demolition with On-Site
Containment Cross-Section (25% Hazardous)

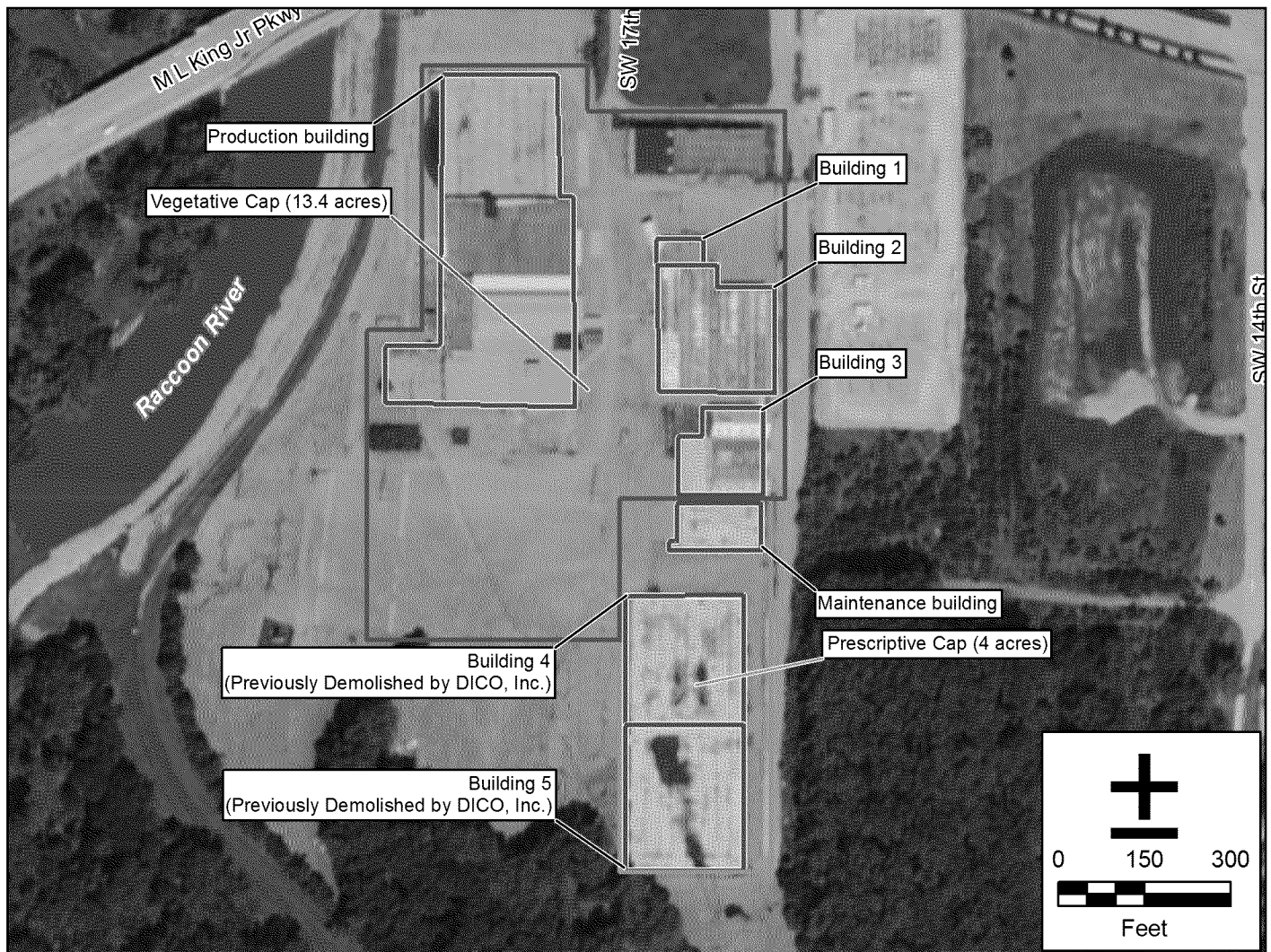


TETRA TECH

Date: 8/1/2017

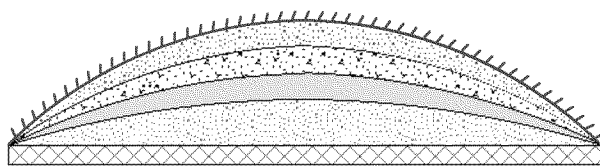
Drawn By: Clayton Hayes

Project No: X9025.16.0144.000



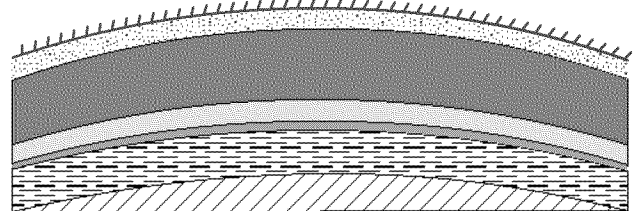
SECTION A: BUILDING DEMOLITION WITH ON-SITE CONTAINMENT (75% HAZARDOUS)

VEGETATIVE CAP



NOT TO SCALE

PREScriptive CAP



NOT TO SCALE

Legend

- | | |
|---|---------------------------------------|
| Vegetative cover | Prescriptive Cap |
| Footprint of building | Topsoil (12 inches) |
| Proposed Asphalt | Protective layer (36 inches) |
| Proposed Prescriptive Cap | Drainage netting |
| Vegetative Cap | HDPE liner (60 millimeters) |
| Topsoil (6 inches) | Clay (2 feet) |
| Fill (6 inches) | Hazardous building debris (~1.4 feet) |
| Clay (6 inches) | ~ Approximate |
| Non-hazardous building debris (~1.6 feet) | |
| Existing asphalt/concrete | |

Source: ESRI, ArcGIS Online Maps, World Imagery, 2014; HSIP Gold, 2007

Des Moines TCE Site
Des Moines, Iowa

Figure 8

Alternative 3 - Building Demolition with On-Site
Containment Cross-Section (75% Hazardous)



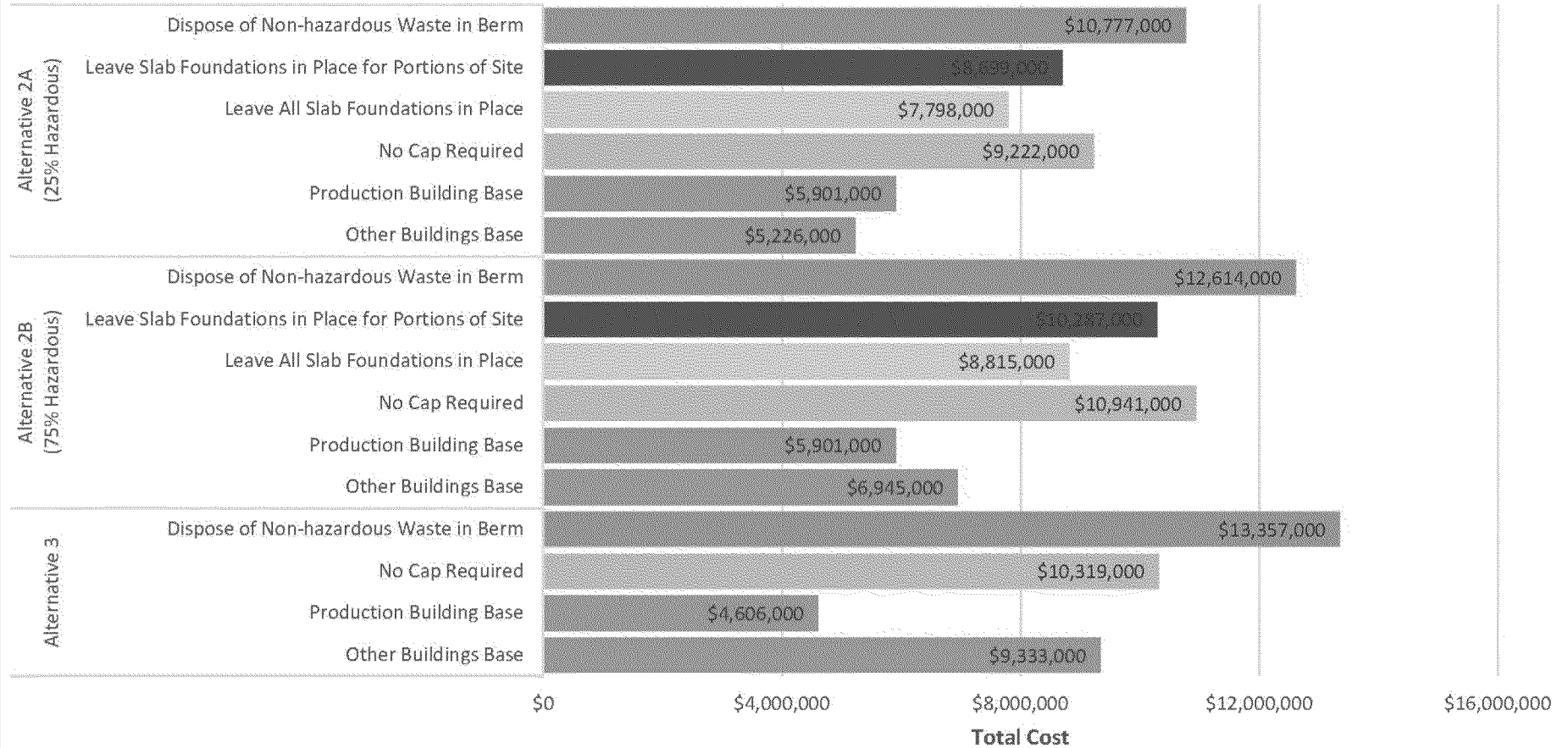
TETRA TECH

Date: 8/1/2017

Drawn By: Clayton Hayes

Project No: X9025.16.0144.000

Potential Cost Comparison for Alternatives 2 and 3



Note: The total base cost for each alternative is the "Other Buildings Base" cost plus the "Production Building Base" cost.
For example, the total base cost for Alternative 2A is \$5,226,000 + \$5,901,000 = \$11,127,000.

Des Moines TCE Site
Des Moines, Iowa

Figure 9
Potential Cost Comparison
for Alternatives 2 and 3



Date: 8/31/17

Drawn By: Nick Wiederholt

Project No: X3025.16.0144.000

BUILDING SAMPLE RESULT TABLES

TABLE BUILDING 1

WIPE SAMPLES ANALYTICAL DATA SUMMARY

Boring			WS-01	WS-02	WS-03	WS-04	WS-05	WS-06	WS-07	WS-08	WS-09	WS-10	WS-11	WS-12	WS-13	WS-13 (FD)	WS-14	WS-15	WS-16	WS-17	WS-18	WS-19	WS-19 (FD)	WS-20	WS-21	WS-22	WS-22 (FD)	
Sample			Building 3 - Southwest Brick Wall	Building 3 - Southeast Corner Steel I-Beam	Building 3 - North Central Concrete Floor	Building 3 - East Side Sheet Metal Surface	Building 2 - East Side Concrete Floor	Building 2 - North Side Brick Wall	Building 2 - Center Metal I-Beam	Building 2 - Southwest Wall Surface Coating	Building 1 - Center Concrete Floor	Building 1 - West Brick Wall	Building 1 - North Wall Metal Sheeting	Building 1 - Center Metal Box Surface	Production Building - North Central Concrete	Production Building - North Central Concrete	Center of Building Concrete	Production Building - South Central Concrete	Production Building - Central Easter I-Beam	Production Building - Central I-Beam	Production Building - NW Corner I-Beam	Production Building - SE Corner Sheet Metal	Production Building - SE Corner Sheet Metal	Production Building - NW Corner Sheet Metal	Production Building - Central Eastern Brick	Production Building - SW Corner Brick	Production Building - SW Corner Brick	
Chemical	Cas No.	Units	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	
Pesticides																												
ALDRIN	309-00-2	µg/cm ²	< 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND	
ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	319-84-6	µg/cm ²	< 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND	
ALPHA ENDOSULFAN	959-98-8	µg/cm ²	< 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND	
ALPHA-CHLORDANE	5103-71-9	µg/cm ²	< 0.00050	ND < 0.00050	ND < 0.00050	ND 0.00095	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND 0.0028	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND	
BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	319-85-7	µg/cm ²	< 0.00050	ND < 0.00050	ND 0.00054	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND	
BETA ENDOSULFAN	33213-65-9	µg/cm ²	< 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND 0.0011	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND	
Chlordane; Gamma-	5566-34-7	µg/cm ²	< 0.00050	ND < 0.00050	ND 0.0013	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND 0.0056	ND < 0.00050	ND 0.00051	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND	
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	319-86-8	µg/cm ²	< 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND	
DIELDRIN	60-57-1	µg/cm ²	< 0.0010	ND < 0.0010	ND 0.0013	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND 0.0032	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND	
ENDOSULFAN SULFATE	1031-07-8	µg/cm ²	< 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND 0.0012	J < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND	
ENDRIN	72-20-8	µg/cm ²	< 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND 0.0026	ND < 0.0010	ND < 0.0010	ND 0.0013	J < 0.0010	ND 0.0025	J 0.0062	J < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND	
ENDRIN ALDEHYDE	7421-93-4	µg/cm ²	< 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND 0.0018	J 0.0015	J 0.0023	J < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND	
ENDRIN KETONE	53494-70-5	µg/cm ²	< 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND 0.0016	J 0.0012	J 0.0026	J < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND	
GAMMA BHC (LINDANE)	58-89-9	µg/cm ²	< 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND	
HEPTACHLOR	76-44-8	µg/cm ²	< 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND	
HEPTACHLOR EPOXIDE	1024-57-3	µg/cm ²	< 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND 0.00079	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND 0.00063	ND 0.00071	ND 0.00070	ND < 0.00050	ND 0.00052	J < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND < 0.00050	ND	
METHOXYCHLOR	72-43-5	µg/cm ²	< 0.0050	ND < 0.0050	ND < 0.0050	ND < 0.0050	ND < 0.0050	ND < 0.0050	ND < 0.0050	ND < 0.0050	ND < 0.0050	ND < 0.0050	ND < 0.0050	ND < 0.0050	ND < 0.0050	ND 0.0064	J < 0.0050	ND < 0.0050	ND 0.040	J < 0.0050	ND < 0.0050	ND < 0.0050	ND < 0.0050	ND < 0.0050	ND < 0.0050	ND < 0.0050	ND	
P,P'-DDD	72-54-8	µg/cm ²	< 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND 0.0027	J < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND	
P,P'-DDE	72-55-9	µg/cm ²	< 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND 0.0020	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND 0.12	ND 0.0061	ND 0.0036	ND 0.0051	ND 0.0026	J 0.0017	J 0.0047	J 0.0027	J < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND	
P,P'-DDT	50-29-3	µg/cm ²	< 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND 0.0025	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND 0.0048	ND < 0.0010	ND < 0.0010	ND 0.0012	J < 0.0010	ND 0.0063	J 0.0028	J < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND < 0.0010	ND 0.0028	ND 0.0035	
TOXAPHENE	8001-35-2	µg/cm ²	< 0.050	ND < 0.050	ND < 0.050	ND < 0.050	ND < 0.050	ND < 0.050	ND < 0.050	ND < 0.050	ND < 0.050	ND < 0.050	ND < 0.050	ND < 0.050	ND < 0.050	ND < 0.050	ND < 0.050	ND < 0.050	ND < 0.050	ND < 0.050	ND < 0.050	ND < 0.050	ND < 0.050	ND < 0.050	ND < 0.050	ND < 0.050	ND	
PCBs																												
PCB-1016 (AROCLOR 1016)	12674-11-2	µg/cm ²	< 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND	
PCB-1221 (AROCLOR 1221)	11104-28-2	µg/cm ²	< 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND	
PCB-1232 (AROCLOR 1232)	11141-16-5	µg/cm ²	< 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND	
PCB-1242 (AROCLOR 1242)	53469-21-9	µg/cm ²	< 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND	
PCB-1248 (AROCLOR 1248)	12672-29-6	µg/cm ²	< 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND	
PCB-1254 (AROCLOR 1254)	11097-69-1	µg/cm ²	< 0.010	ND < 0.010	ND 0.023	ND < 0.010	ND 0.015	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.010	ND < 0.01		

TABLE BUILDING 1 (Continued)

WIPE SAMPLES ANALYTICAL DATA SUMMARY

Boring			WS-01	WS-02	WS-03	WS-04	WS-05	WS-06	WS-07	WS-08	WS-09	WS-10	WS-11	WS-12	WS-13	WS-13 (FD)	WS-14	WS-15	WS-16	WS-17	WS-18	WS-19	WS-19 (FD)	WS-20	WS-21	WS-22	WS-22 (FD)	
Sample			Building 3 - Southwest Brick Wall	Building 3 - Southeast Corner Steel I-Beam	Building 3 - North Central Concrete Floor	Building 3 - East Side Sheet Metal Surface	Building 2 - East Side Concrete Floor	Building 2 - North Side Brick Wall	Building 2 - Center Metal I-Beam	Building 2 - Southwest Wall Surface Coating	Building 1 - Center Concrete Floor	Building 1 - West Brick Wall	Building 1 - North Wall Metal Sheeting	Building 1 - Center Metal Box Surface	Production Building - North Central Concrete	Production Building - North Central Concrete	Center of Building Concrete	Production Building - South Central Concrete	Production Building - Central Easter I-Beam	Production Building - Central I-Beam	Production Building - NW Corner I-Beam	Production Building - SE Corner Sheet Metal	Production Building - NW Corner Sheet Metal	Production Building - Central Eastern Brick	Production Building - SW Corner Brick	Production Building - SW Corner Brick		
Chemical	Cas No.	Units	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result		
Dioxins																												
2,3,7,8-TCDF	51207-31-9	ng/m ²		ND	ND		ND		ND		ND		ND		ND		ND	2.9			ND		ND		ND		ND	
2,3,7,8-TCDD	1746-01-6	ng/m ²		ND	ND	8.6		ND	15		ND		ND		ND	220		ND	1.7	2.9	21		ND	16	6.6	23		ND
1,2,3,7,8-PeCDF	57117-41-6	ng/m ²		ND	ND	ND		ND		ND		ND		ND		ND		ND		ND		ND	ND	ND	ND	ND	ND	
2,3,4,7,8-PeCDF	57117-31-4	ng/m ²		ND	ND	ND		ND		ND		ND		ND		ND		ND		ND		ND	ND	ND	ND	ND	ND	
1,2,3,7,8-PeCDD	40321-76-4	ng/m ²		ND	ND	ND		ND		ND		ND		ND		ND		ND		ND		ND	ND	ND	ND	ND	ND	
1,2,3,4,7,8-HxCDF	70648-26-9	ng/m ²		ND	ND	ND		ND		ND		ND		ND		ND		ND		ND		ND	ND	ND	ND	ND	ND	
1,2,3,6,7,8-HxCDF	57117-44-9	ng/m ²		ND	ND	ND		ND		ND		ND		ND		ND		ND		ND		ND	ND	ND	ND	ND	ND	
2,3,4,6,7,8-HxCDF	60851-34-5	ng/m ²		ND	ND	ND		ND		ND		ND		ND		ND		ND		ND		ND	ND	ND	ND	ND	ND	
1,2,3,7,8,9-HxCDF	72918-21-9	ng/m ²		ND	ND	ND		ND		ND		ND		ND		ND		ND		ND		ND	ND	ND	ND	ND	ND	
1,2,3,4,7,8-HxCDD	39227-28-6	ng/m ²		ND	ND	ND		ND		ND		ND		ND		ND		ND		ND		ND	ND	ND	ND	ND	ND	
1,2,3,6,7,8-HxCDD	57653-85-7	ng/m ²		ND	ND	ND		ND		ND		ND		ND		ND		ND		ND		ND	ND	ND	ND	ND	ND	
1,2,3,7,8,9-HxCDD	19408-74-3	ng/m ²		ND	ND	ND		ND		ND		ND		ND		ND		ND		ND		ND	ND	ND	ND	ND	ND	
1,2,3,4,6,7,8-HpCDF	67562-39-4	ng/m ²		ND	ND	ND		ND		ND		ND		ND	10		ND		ND		ND		ND	37		22	6.8	
1,2,3,4,7,8,9-HpCDF	55673-89-7	ng/m ²		ND	ND	ND		ND		ND		ND		ND		ND		ND		ND		ND	ND	ND	ND	ND	ND	
1,2,3,4,6,7,8-HpCDD	35822-46-9	ng/m ²		ND	ND	8.8		ND	9.3		ND		ND		ND	43		ND		ND		ND	ND	ND	98	43	24	
OCDF	39001-02-0	ng/m ²		ND	ND	ND		ND	14		ND		ND		ND	18		ND		ND		ND	ND	ND	110	72	24	
OCDD	3268-87-9	ng/m ²	53		ND	76		ND	110		ND		ND		ND	280		ND		ND		ND	ND	ND	1300	660	390	
Total TCDF	30402-14-3	ng/m ²		ND	ND	ND		ND		ND		ND		ND		ND	25		ND		ND		ND	ND	ND	ND	ND	
Total TCDD	41903-57-5	ng/m ²		ND	ND	8.6		ND	15		ND		ND		ND	240		ND	1.7	2.9	25		ND		ND	ND	ND	
Total PeCDF	30402-15-4	ng/m ²		ND	ND	ND		ND		ND		ND		ND		ND	12		ND		ND		ND	ND	ND	ND	ND	
Total PeCDD	36088-22-9	ng/m ²		ND	ND	ND		ND		ND		ND		ND		ND		ND		ND		ND	ND	ND	ND	ND	ND	
Total HxCDF	55684-94-1	ng/m ²		ND	ND	ND		ND		ND		ND		ND		ND	5.9		ND		ND		ND	ND	ND	23	5.2	
Total HxCDD	34465-46-8	ng/m ²		ND	ND	ND		ND		ND		ND		ND		ND	7.8		ND		ND		ND	ND	ND	11	ND	
Total HpCDF	38998-75-3	ng/m ²		ND	ND	ND		ND	5.8		ND		ND		ND	23		ND		ND		ND		ND	140	71	25	
Total HpCDD	37871-00-4	ng/m ²		ND	8.8		ND		ND		ND		ND		ND	79		ND		ND		ND	ND	ND	180	88	49	
TEQ	E17134024	ng/m ²	0.053		ND	8.8		ND	15		ND		ND		ND	220		ND	1.7	2.9	24		ND		ND	2.8	1.4	0.72

Notes:

Highlighted values indicate a detection.

µg/cm ²	Micrograms per squared centimeter	OCDD	Octachlorodibenzodioxin
ng/m ²	Nanograms per squared meter	OCDF	Octachlorodibenzofuran
BHC	Benzene hexachloride	PCB	Polychlorinated biphenyl
DDD	Dichlorodiphenyldichloroethane	PeCDD	Pentachlorodibenzo-p-dioxin
DDE	Dichlorodiphenyldichloroethylene	PeCDF	Pentachlorodibenzofuran
DDT	Dichlorodiphenyltrichloroethane	TCDD	Tetrachlorodibenzo-p-dioxins
FD	Field duplicate	TCDF	Tetrachlorodibenzofuran
HpCDD	Heptachlorodibenzo-p-dioxin	TEQ	Toxic equivalency
HpCDF	Heptachlorodibenzofuran	WS	Wipe sample
HxCDD	Hexachlorodibenzo-p-dioxin		
HxCDF	Hexachlorodibenzofuran		
I	Interference present		
J	Estimate		
NDJ	Not detected estimate		

TABLE BUILDING 2																																																		
BUILDING MATERIAL SAMPLES ANALYTICAL DATA SUMMARY																																																		
Boring			BMS-01	BMS-02	BMS-03	BMS-04	BMS-05	BMS-06	BMS-07	BMS-08	BMS-09	BMS-10	BMS-11	BMS-12	BMS-13	BMS-14	BMS-15	BMS-16	BMS-17	BMS-18	BMS-19	BMS-20	BMS-21	BMS-22	BMS-23	BMS-24																								
Sample			Building 3 - Center East Brick Wall	Building 3 - Center South Insulation Wall	Building 3 - SW Corner Cinder Block	Building 3 - Center East Wall Coating	Building 2 - Center East Brick Wall	Building 2 - Center South Wall Insulation	Building 2 - Center North Wall Cinder Block	Building 2 - Center Coating	Building 2 - North Room Dry Wall	Building 1 - South Brick Wall	Building 1 - Center of Building Insulation	Building 1 - East Wall Dry Wall	Building 1 - West Wall Coating	Production Building - NW Corner Brick	Production Building - NW Corner Brick	Production Building - West Wall Cinder Block	Production Building - North Wall Insulation	Production Building - Center of North Dry Wall	Production Building - Center of North Insulation	Production Building - Center of Building Brick	Production Building - Center of Building Coating	Production Building - Wall Insulation	Production Building - Center of Building Wood Wall	Production Building - Southeastern Wood Building																								
Chemical	Cas No.	Units	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result																								
Pesticides																																																		
ALDRIN	309-00-2	µg/kg	< 1.7	ND	17	< 17000	ND	750	< 17	ND	9.0	63	710	320	< 1.7	ND	< 6.2	ND	< 1.7	ND	200	< 1.7	ND	14	J	< 1.7	ND	9.6	< 2.0	ND	< 5.2	ND	< 1.7	ND	440	6.8	J	4.1	J	< 2.0	NDJ									
ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	319-84-6	µg/kg	< 1.7	ND	< 8.7	ND	< 17000	ND	< 50	ND	< 17	ND	< 5.1	ND	< 1.7	ND	< 6.2	ND	< 1.7	ND	< 52	ND	< 1.7	ND	< 1.7	ND	< 1.7	ND	< 5.2	ND	< 2.0	ND	< 5.2	ND	< 1.7	ND	< 49	ND	< 4.9	ND	3.0	J	< 2.0	ND						
ALPHA ENDOSULFAN	959-98-8	µg/kg	< 1.7	ND	< 8.7	ND	< 17000	ND	< 50	ND	< 17	ND	7.8	5.9	150	14	< 1.7	ND	9.2	< 1.7	ND	270	J	< 1.7	ND	6.5	J	2.1	< 5.2	ND	< 2.0	ND	< 5.2	ND	< 1.7	ND	400	29	J	< 1.8	ND	< 2.0	ND							
ALPHA-CHLORDANE	5103-71-9	µg/kg	4.9	88	780000	2500	680	26	26	180	99	8.8	11	< 1.7	ND	1500	< 1.7	ND	21	J	6.6	12	7.5	7.4	< 1.7	ND	< 49	ND	< 4.9	ND	< 1.8	NDJ	12																	
BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	319-85-7	µg/kg	< 1.7	ND	< 8.7	ND	< 17000	ND	130	< 17	ND	9.4	< 1.7	ND	160	19	< 1.7	ND	6.2	3.0	93	< 1.7	ND	20	J	4.4	J	< 5.2	ND	< 2.0	ND	7.6	5.9	230	J	35	J	9.8	J	5.1	J									
BETA ENDOSULFAN	33213-65-9	µg/kg	< 3.4	ND	64	< 33000	ND	540	< 33	ND	13	< 3.4	ND	110	12	< 3.3	ND	< 12	ND	< 3.3	ND	350	J	< 3.3	ND	11	J	< 3.3	ND	< 10	ND	< 3.9	ND	< 10	ND	< 3.3	ND	180	J	37	J	17	J	7.4	J					
Chlordane; Gamma-	5566-34-7	µg/kg	7.6	73	860000	3600	750	60	60	530	190	11	25	7.5	1800	< 1.7	ND	20	J	6.8	J	12	7.0	12	< 1.7	ND	710	J	< 4.9	NDJ	< 1.8	NDJ	11	J																
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	319-86-8	µg/kg	< 1.7	ND	8.7	< 17000	ND	< 50	ND	< 17	ND	< 5.1	ND	< 1.7	ND	< 51	ND	< 2.0	ND	< 1.7	ND	< 6.2	ND	< 1.7	ND	< 1.7	ND	< 1.7	ND	< 5.2	ND	< 2.0	ND	< 5.2	ND	< 1.7	ND	< 49	ND	13	J	4.2	J	< 2.0	ND					
DIELDRIN	60-57-1	µg/kg	12	110	150000	6700	150	99	140	1600	710	18	49	15	1600	J	< 3.3	ND	28	J	9.3	24	< 3.9	ND	35	< 3.3	ND	890	J	48	J	9.8	J	10	J															
ENDOSULFAN SULFATE	1031-07-8	µg/kg	< 3.4	ND	68	< 33000	ND	220	< 33	ND	< 10	ND	< 3.4	ND	< 100	ND	< 3.9	ND	< 3.3	ND	38	< 3.3	ND	16	J	14	J	< 10	ND	< 3.9	ND	< 10	ND	< 3.3	ND	< 95	ND	76	J	150	< 3.9	ND								
ENDRIN	72-20-8	µg/kg	< 3.4	ND	< 17	ND	< 33000	ND	400	< 33	ND	24	5.9	260	28	6.1	< 12	ND	8.7	490	J	< 3.3	ND	20	J	4.1	< 10	ND	< 3.9	ND	13	3.9	220	190	J	< 3.6	ND	31	J											
ENDRIN ALDEHYDE	7421-93-4	µg/kg	< 3.4	ND	< 17	ND	< 33000	ND	350	< 33	ND	14	< 3.4	ND	130	25	< 3.3	ND	< 12	ND	< 3.3	ND	440	J	< 3.3	ND	22	J	28	J	< 10	ND	< 3.9	ND	13	< 3.3	ND	22000	J	160	J	120	17	J						
ENDRIN KETONE	53494-70-5	µg/kg	< 3.4	ND	21	< 33000	ND	480	< 33	ND	< 10	ND	5.2	240	35	< 3.3	ND	< 12	ND	< 3.3	ND	260	5.1	< 3.3	ND	61	< 10	ND	< 3.9	ND	11	< 3.3	ND	< 95	ND	340	J	< 3.6	ND	6.7	J									
GAMMA BHC (LINDANE)	58-89-9	µg/kg	< 1.7	ND	< 8.7	ND	< 17000	ND	62	< 17	ND	< 5.1	ND	< 1.7	ND	< 51	ND	6.4	< 1.7	ND	< 6.2	ND	< 1.7	ND	< 52	ND	< 1.7	ND	< 1.7	ND	< 5.2	ND	< 2.0	ND	< 5.2	ND	< 1.7	ND	< 49	ND	11	J	16	J	< 2.0	NDJ				
HEPTACHLOR	76-44-8	µg/kg	< 1.7	ND	< 8.7	ND	54000	340	46	6.3	11	170	100	< 1.7	ND	< 6.2	ND	< 1.7	ND	280	J	< 1.7	ND	6.0	J	< 1.7	ND	< 5.2	ND	< 2.0	ND	< 5.2	ND	< 1.7	ND	< 49	ND	< 4.9	ND	< 1.8	ND	< 2.0	ND							
HEPTACHLOR EPOXIDE	1024-57-3	µg/kg	< 1.7	ND	30	24000	180	< 17	ND	18	20	210	22	< 1.7	ND	35	4.8	390	< 1.7	ND	< 1.7	ND	7.6	< 2.0	ND	13	< 1.7	ND	390	J	12	J	4.6	J	8.9	J														
METHOXYCHLOR	72-43-5	µg/kg	< 17	ND	< 87	ND	< 170000	ND	1300	< 170	ND	< 51	ND	< 17	ND	< 510	ND	< 20	ND	< 17	ND	< 62	ND	< 17	ND	< 520	ND	< 17	ND	35	J	< 17	ND	< 52	ND	< 20	ND	< 52	ND	< 17	ND	< 490	ND	580	J	120	J	< 20	ND	
P,P'-DDD	72-54-8	µg/kg	< 3.4	ND	< 17	ND	< 33000	ND	290	< 33	ND	< 10	ND	< 3.4	ND	< 100	ND	17	< 3.3	ND	14	3.4	890	J	< 3.3	ND	< 3.3	ND	< 3.3	ND	< 10	ND	< 3.9	ND	< 10	ND	< 3.3	ND	230	J	< 9.6	ND	47	J	< 3.9	ND				
P,P'-DDE	72-55-9	µg/kg	< 3.4	ND	21	35000	1100	< 33	ND	40	37	1300	99	16	230	41	6900	< 3.3	ND	13	J	5.0	10	< 3.9	ND	< 10	ND	< 3.3	ND	420	89	J	41	J	19	J														
P,P'-DDT	50-29-3	µg/kg	3.5	45	< 33000	ND	260	< 33	ND	22	21	970	39	11	72	14	6800	< 3.3	ND	16	J	3.8	J	< 10	ND	< 3.9	ND	< 10	ND	< 3.3	ND	1500	J	100	J	110	96	J												
TOXAPHENE	8001-35-2	µg/kg	< 170	ND	< 870	ND	< 1700000	ND	< 5000	ND	< 1700	ND	< 510	ND	< 170	ND	< 5100	ND	< 200	ND	< 170	ND	< 620	ND	< 170	ND	< 5200	ND	< 170	ND	< 170	ND	< 520	ND	< 200	ND	< 520	ND	< 170	ND	< 4900	ND	< 490	ND	< 180	ND	< 200	ND		
PCBs																																																		
PCB-1016 (AROCLOR 1016)	12674-11-2	µg/kg	< 34	NDJ	< 170	ND	< 33000	ND	< 970	ND	< 33	ND	< 100	ND	< 34	ND	< 1000	ND	< 39	ND	< 33	ND	< 120	ND	< 33	ND	< 1000	ND	< 33	ND	< 33	ND	< 33	ND	< 100	ND	< 39	ND	< 100	ND	< 33	ND	< 950	ND	< 96	ND	< 36	ND	< 39	ND
PCB-1221 (AROCLOR 1221)	11104-28-2	µg/kg	< 34	ND	< 170	ND	< 33000	ND	< 970	ND	< 33	ND	< 100	ND	< 34	ND	< 1000	ND	< 39	ND	< 33	ND	< 120	ND	< 33	ND	< 1000	ND	< 33	ND	< 33	ND	< 33	ND	< 100	ND	< 39	ND	< 100	ND	< 33	ND	< 950	ND	< 96	ND	< 36	ND	< 39	ND
PCB-1232 (AROCLOR 1232)	11141-16-5	µg/kg	< 34	ND	< 170	ND	< 33000	ND	< 970	ND	< 33	ND	< 100	ND	< 34	ND	< 1000	ND	< 39	ND	< 33	ND	< 120	ND	< 33	ND	< 1000	ND	< 33	ND	< 33	ND	< 100	ND	< 39	ND	< 100	ND	< 33	ND	< 950	ND	< 96	ND	< 36	ND	< 39	ND		
PCB-1242 (AROCLOR 1242)	53469-21-9	µg/kg	< 34	ND	< 170	ND	< 33000	ND	< 970	ND	< 33	ND	< 100	ND	< 34	ND	< 1000	ND	< 39	ND	< 33	ND	< 120	ND	< 33	ND	< 1000	ND	< 33	ND	< 33	ND	< 100	ND	< 39	ND	< 100	ND	< 33	ND	< 950	ND	< 96	ND	< 36	ND	< 39	ND		

TABLE BUILDING 2 (Continued)																																																									
BUILDING MATERIAL SAMPLES ANALYTICAL DATA SUMMARY																																																									
Boring			BMS-01	BMS-02	BMS-03	BMS-04	BMS-05	BMS-06	BMS-07	BMS-08	BMS-09	BMS-10	BMS-11	BMS-12	BMS-13	BMS-14	BMS-15	BMS-16	BMS-17	BMS-18	BMS-19	BMS-20	BMS-21	BMS-22	BMS-23	BMS-24																															
Sample			Building 3 - Center East Brick Wall	Building 3 - Center South Insulation Wall	Building 3 - SW Corner Cinder Block	Building 3 - Center East Wall Coating	Building 2 - Center East Brick Wall	Building 2 - Center South Wall Insulation	Building 2 - Center North Wall Cinder Block	Building 2 - Center Coating	Building 2 - North Room Dry Wall	Building 1 - South Brick Wall	Building 1 - Center of Building Insulation	Building 1 - East Wall Dry Wall	Building 1 - West Wall Coating	Production Building - NW Corner Brick	Production Building - NW Corner Brick	Production Building - West Wall Cinder Block	Production Building - North Wall Insulation	Production Building - Center of North Dry Wall	Production Building - Center of North Insulation	Production Building - Center of Building Brick	Production Building - Center of Building Coating	Production Building - Wall Insulation	Production Building - Center of Building Wood Wall	Production Building - Southeastern Wood Building																															
Chemical	Cas No.	Units	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result																															
Dioxins																																																									
2,3,7,8-TCDF	51207-31-9	ng/kg		ND	9.2			ND	17			ND	7.8			ND	10			ND	8.6		1.5		2.1			ND	1.8			ND	3.7		1.1		64		5.5		8.2		1.6														
2,3,7,8-TCDD	1746-01-6	ng/kg		ND	28		14		230		1.3		440		28		670		19		3		160		9.9		680		4.8		1.7		3.1		3.3			ND	5.4		1.6		56		7.5		10		1.4								
1,2,3,7,8-PeCDF	57117-41-6	ng/kg		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		21		5.8			ND		ND												
2,3,4,7,8-PeCDF	57117-31-4	ng/kg		ND	12			ND	15			ND	15		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		45		14		27			ND											
1,2,3,7,8-PeCDD	40321-76-4	ng/kg		ND		ND		ND		ND		ND	8.2			ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		22			ND		ND		ND												
1,2,3,4,7,8-HxCDF	70648-26-9	ng/kg		ND	25			ND	17			ND	15			ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		0		24		10			ND										
1,2,3,6,7,8-HxCDF	57117-44-9	ng/kg		ND	13			ND	6.7			ND	19		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		28		19		7.7			ND											
2,3,4,6,7,8-HxCDF	60851-34-5	ng/kg		ND	5.8			ND		ND		ND	18			ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		32		26		13			ND										
1,2,3,7,8,9-HxCDF	72918-21-9	ng/kg		ND		ND		ND		ND		ND	6.4			ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		10		11			ND		ND										
1,2,3,4,7,8-HxCDD	39227-28-6	ng/kg		ND		ND		ND		ND		ND	7.7			ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		8.4		6.4			ND		ND										
1,2,3,6,7,8-HxCDD	57653-85-7	ng/kg		ND	6.2			ND	10			ND	21			ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		130		19		9.4			ND										
1,2,3,7,8,9-HxCDD	19408-74-3	ng/kg		ND	7.4			ND	5.1			ND	19			ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		56		14			ND		ND										
1,2,3,4,6,7,8-HpCDF	67562-39-4	ng/kg		ND	39		20		30			ND	130			ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		33		19			ND		570		130		59		6.7				
1,2,3,4,7,8,9-HpCDF	55673-89-7	ng/kg		ND	6.7			ND		ND		ND	12			ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		20		17			ND		ND								
1,2,3,4,6,7,8-HpCDD	35822-46-9	ng/kg		ND	140		48		740			ND	380			ND		43		5.5			ND	42			ND		470		16		8.9		14		73			ND		61		5.4		1700		210		90		17					
OCDF	39001-02-0	ng/kg		ND	87		49		41			ND	280			ND		ND				ND		ND		ND		ND		24		11			ND		ND		43			ND		37			ND		430		100		45		11		
OCDD	3268-87-9	ng/kg	17		1300		360		22000			ND	2700		21		170		54		32		250			ND		710		120		47		57		520		91		600		20		44000		850		540		180							
Total TCDF	30402-14-3	ng/kg		ND	43		34		190			ND	130			ND		230			ND		29			ND		160		12		14		1		15			ND		35		9.1		730		88		190		30						
Total TCDD	41903-57-5	ng/kg		ND	29		14		260		1.3		480		28		730		19		3		200		9.9		920		6.1		1.7		3.1		4.6			ND		8.2		5		150		23		26		2.9							
Total PeCDF	30402-15-4	ng/kg		ND	66			ND	130			ND	130			ND		74			ND		19			ND		170			ND			ND		ND		ND		17			ND		20			ND		470		140		290		47	
Total PeCDD	36088-22-9	ng/kg		ND		ND		ND	10			ND	29			ND		9.9			ND		28			ND		400			ND			ND		ND		ND		ND		ND		ND		150		29		16			ND				
Total HxCDF	55684-94-1	ng/kg		ND	91		12		80			ND	220			ND		ND			ND		10			ND		200			6.2			ND		ND		ND		ND		20			ND		960		230		200		17				
Total HxCDD	34465-46-8	ng/kg		ND	52			ND	92			ND	170			ND		82			ND		9.9			ND		1100		9.5		5.4		8.7		58			ND		29		7		1300		200		75		5.5						
Total HpCDF	38998-75-3	ng/kg		ND	92		20		71			ND	300			ND		17			ND		20			ND		100		14		5.3			ND		59			ND		40		5.4		1500		240		140		12					
Total HpCDD	37871-00-4	ng/kg		ND	280		87		1600			ND	700			ND		85		11			ND		87		1100		33		17		26		160			ND		120		11		3900		430		180		34							
TEQ	E17134024	ng/kg	0.017		44		15		270		1.3		470		28		670		19		3		160		9.9		740		5.3		2		3.3		5.7		0.091		7.2		1.8		190		32		30		2								

Notes:

Highlighted values indicate a detection.

µg/kg	Micrograms per kilogram	DDT	Dichlorodiphenyltrichloroethane	J	Estimate	PeCDF	Pentachlorodibenzofuran
ng/kg	Nanograms per kilogram	HpCDD	Heptachlorodibenzo-p-dioxin	NDJ	Not detected estimate	TCDD	Tetrachlorodibenzo-p-dioxins
BHC	Benzene hexachloride	HpCDF	Heptachlorodibenzofuran	OCDD	Octachlorodibenzodioxin	TCDF	Tetrachlorodibenzofuran
BMS	Building material sample	HxCDD	Hexachlorodibenzo-p-dioxin	OCDF	Octachlorodibenzofuran	TEQ	Toxic equivalency
DDD	Dichlorodiphenyldichloroethane	HxCDF	Hexachlorodibenzofuran	PCB	Polychlorinated biphenyl		
DDE	Dichlorodiphenyldichloroethylene	I	Interference present	PeCDD	Pentachlorodibenzo-p-dioxin		

TABLE BUILDING 3

CONCRETE SAMPLES ANALYTICAL DATA SUMMARY

Boring			SB-01		SB-02		SB-03		SB-04		SB-05		SB-06		SB-07		SB-08		SB-09		SB-10		SB-10 (FD)		SB-11		SB-12		SB-13		SB-14		SB-15		SB-16		SB-17	
Sample			South bldg. 5 - SB-01 Concrete		North bldg. 5 - SB-02 Concrete		South bldg. 4 - SB-03 Concrete		North bldg. 4 - SB-04 Concrete		West maintenance bldg. - SB-05 Concrete		East maintenance bldg. - SB-06 Concrete		South bldg. 3 - SB-07 Concrete		North bldg. 3 - SB-08 Concrete		East bldg. 2 - SB-09 Concrete		West bldg. 2 - SB-10 Concrete		West Bldg. 2 - SB-10 Concrete		North bldg. 2 - SB-11 Concrete		North Bldg 1 - SB-12 Concrete		South bldg. 1 - SB-13 Concrete		Production Building - SB-14 Concrete		Production Building - SB-15 Concrete		Production Building - SB-16 Concrete		Production Building - SB-17 Concrete	
Chemical	Cas No.	Units	Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
Pesticides																																						
ALDRIN	309-00-2	µg/kg	130	J	850		510		540		640		420		840		16000		1600		160		67		1000		< 34	ND	55		150		41		7.6		400	
ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	319-84-6	µg/kg	< 1.7	ND	< 17	ND	< 17	ND	< 17	ND	< 17	ND	< 8.5	ND	< 17	ND	< 340	ND	< 17	ND	< 1.7	ND	< 1.7	ND	< 17	ND	< 34	ND	< 8.5	ND	< 1.7	ND	< 17	ND	< 1.7	ND	< 8.5	ND
ALPHA ENDOSULFAN	959-98-8	µg/kg	< 1.7	ND	< 17	ND	< 17	ND	< 17	ND	< 17	ND	< 8.5	ND	< 17	ND	< 340	ND	< 17	ND	1.8		< 1.7	ND	< 17	ND	< 34	ND	< 8.5	ND	< 1.7	ND	< 17	ND	< 1.7	ND	< 8.5	ND
ALPHA-CHLORDANE	5103-71-9	µg/kg	< 1.7	ND	110		54		< 17	ND	< 17	ND	240		89		< 340	ND	40		16		< 1.7	ND	44		< 34	ND	46		< 1.7	ND	< 17	ND	< 1.7	ND	< 8.5	ND
BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	319-85-7	µg/kg	< 1.7	ND	< 17	ND	< 17	ND	< 17	ND	< 17	ND	< 8.5	ND	< 17	ND	< 340	ND	< 17	ND	< 1.7	ND	< 1.7	ND	< 17	ND	< 34	ND	< 8.5	ND	< 1.7	ND	< 17	ND	< 1.7	ND	< 8.5	ND
BETA ENDOSULFAN	33213-65-9	µg/kg	< 3.3	ND	< 33	ND	< 33	ND	< 33	ND	< 32	ND	< 16	ND	< 33	ND	< 660	ND	< 33	ND	3.5		< 3.3	ND	< 32	ND	< 65	ND	< 16	ND	< 3.3	ND	33		3.6		< 16	ND
Chlordane; Gamma-	5566-34-7	µg/kg	110		670		250		65		41		400		120		550		220		57		22		130		150		53		< 1.7	NDJ	28		< 1.7	ND	9.1	
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	319-86-8	µg/kg	< 1.7	ND	< 17	ND	< 17	ND	< 17	ND	< 17	ND	< 8.5	ND	< 17	ND	< 340	ND	< 17	ND	< 1.7	ND	< 1.7	ND	< 17	ND	< 34	ND	< 8.5	ND	< 1.7	ND	< 17	ND	< 1.7	ND	< 8.5	ND
DIELDRIN	60-57-1	µg/kg	24	J	140		120		74		97		280		210		1700		670		57		31		430		110		130		51	J	37		22		59	
ENDOSULFAN SULFATE	1031-07-8	µg/kg	4.4	J	< 33	ND	< 33	ND	< 33	ND	< 32	ND	< 16	ND	< 33	ND	< 660	ND	< 33	ND	3.6		< 3.3	ND	< 32	ND	< 65	ND	< 16	ND	< 3.3	ND	< 33	ND	< 3.3	ND	< 16	ND
ENDRIN	72-20-8	µg/kg	< 3.3	ND	< 33	ND	< 33	ND	< 33	ND	< 32	ND	25		< 33	ND	< 660	ND	1200		9.0		5.2		< 32	ND	< 65	ND	< 16	ND	33	J	34		3.3		< 16	ND
ENDRIN ALDEHYDE	7421-93-4	µg/kg	< 3.3	ND	< 33	ND	< 33	ND	< 33	ND	< 32	ND	< 16	ND	< 33	ND	< 660	ND	< 33	ND	4.3		< 3.3	ND	< 32	ND	< 65	ND	23		< 3.3	ND	41		9.5		< 16	ND
ENDRIN KETONE	53494-70-5	µg/kg	3.9	J	< 33	ND	< 33	ND	< 33	ND	< 32	ND	< 16	ND	< 33	ND	< 660	ND	< 33	ND	< 3.3	ND	< 3.3	ND	< 32	ND	< 65	ND	< 16	ND	< 3.3	ND	34		3.9		< 16	ND
GAMMA BHC (LINDANE)	58-89-9	µg/kg	< 1.7	ND	< 17	ND	< 17	ND	< 17	ND	< 17	ND	< 8.5	ND	< 17	ND	< 340	ND	< 17	ND	7.9		< 1.7	ND	< 17	ND	< 34	ND	< 8.5	ND	< 1.7	ND	< 17	ND	< 1.7	ND	< 8.5	ND
HEPTACHLOR	76-44-8	µg/kg	< 1.7	ND	< 17	ND	< 17	ND	< 17	ND	< 17	ND	< 8.5	ND	< 17	ND	< 340	ND	< 17	ND	2.8		< 1.7	ND	34		< 34	ND	< 8.5	ND	2.1	J	< 17	ND	< 1.7	ND	< 8.5	ND
HEPTACHLOR EPOXIDE	1024-57-3	µg/kg	4.5		< 17	ND	< 17	ND	< 17	ND	< 17	ND	21		< 17	ND	< 340	ND	< 17	ND	6.9		4.1		25		< 34	ND	< 8.5	ND	6.2	J	< 17	ND	7.7		< 8.5	ND
METHOXYCHLOR	72-43-5	µg/kg	< 17	ND	< 170	ND	< 170	ND	< 170	ND	< 170	ND	< 85	ND	290		< 3400	ND	< 170	ND	26		< 17	ND	< 170	ND	< 340	ND	< 85	ND	560	J	< 170	ND	< 17	ND	< 85	ND
P,P'-DDD	72-54-8	µg/kg	< 3.3	ND	< 33	ND	< 33	ND	< 33	ND	< 32	ND	< 16	ND	< 33	ND	< 660	ND	< 33	ND	< 3.3	ND	< 3.3	ND	< 32	ND	< 65	ND	< 16	ND	64		< 33	ND	4.2		< 16	ND
P,P'-DDE	72-55-9	µg/kg	8.0	J	< 33	ND	< 33	ND	< 33	ND	< 32	ND	41		140		< 660	ND	190		47		25		280		10000		930		90		1100		61		38	
P,P'-DDT	50-29-3	µg/kg	< 3.3	ND	41		47		< 33	ND	< 32	ND	19		42	J	< 660	ND	< 33	ND	5.7		< 3.3	ND	40		73		97		45		61		< 3.3	ND	20	
TOXAPHENE	8001-35-2	µg/kg	< 170	ND	< 1700	ND	< 1700	ND	< 1700	ND	< 1700	ND	< 850	ND	< 1700	ND	< 34000	ND	< 1700	ND	< 170	ND	< 170	ND	< 1700	ND	< 3400	ND	< 850	ND	< 170	ND	< 1700	ND	< 170	ND	< 850	ND
PCBs																																						
PCB-1016 (AROCLOR 1016)	12674-11-2	µg/kg	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 32	ND	< 33	ND	< 33	NDJ	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 32	ND	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 33	NDJ	< 33	ND
PCB-1221 (AROCLOR 1221)	11104-28-2	µg/kg	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 32	ND	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 32	ND	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 33	NDJ	< 33	ND
PCB-1232 (AROCLOR 1232)	11141-16-5	µg/kg	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 32	ND	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 32	ND	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 33	NDJ	< 33	ND
PCB-1242 (AROCLOR 1242)	53469-21-9	µg/kg	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 32	ND	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 32	ND	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 33	NDJ	< 33	ND
PCB-1248 (AROCLOR 1248)	12672-29-6	µg/kg	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 32	ND	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 32	ND	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 33	NDJ	< 33	ND
PCB-1254 (AROCLOR 1254)	11097-69-1	µg/kg	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 32	ND	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 32	ND	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 33	NDJ	< 33	ND
PCB-1260 (AROCLOR 1260)	11096-82-5	µg/kg	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 32	ND	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 32	ND	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 33	NDJ	< 33	ND
PCB-1262 (AROCHLOR 1262)	PCB1262	µg/kg	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 32	ND	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 32	ND	< 33	ND	< 33	ND	< 33	ND	< 33	ND	< 33	NDJ	< 33	ND

TABLE BUILDING 3 (Continued)

CONCRETE SAMPLES ANALYTICAL DATA SUMMARY

Boring			SB-01		SB-02		SB-03		SB-04		SB-05		SB-06		SB-07		SB-08		SB-09		SB-10		SB-10 (FD)		SB-11		SB-12		SB-13		SB-14		SB-15		SB-16		SB-17				
Sample			South bldg. 5 - SB-01 Concrete		North bldg. 5 - SB-02 Concrete		South bldg. 4 - SB-03 Concrete		North bldg. 4 - SB-04 Concrete		West maintenance bldg. - SB-05 Concrete		East maintenance bldg. - SB-06 Concrete		South bldg. 3 - SB-07 Concrete		North bldg. 3 - SB-08 Concrete		East bldg. 2 - SB-09 Concrete		West bldg. 2 - SB-10 Concrete		West Bldg. 2 - SB-10 Concrete		North bldg. 2 - SB-11 Concrete		North Bldg 1 - SB-12 Concrete		South bldg. 1 - SB-13 Concrete		Production Building - SB-14 Concrete		Production Building - SB-15 Concrete		Production Building - SB-16 Concrete		Production Building - SB-17 Concrete				
Chemical	Cas No.	Units	Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result				
Dioxins																																									
2,3,7,8-TCDF	51207-31-9	ng/kg		ND		ND		ND		ND		ND		ND		ND	1.9			ND		ND		NA	5.7		1.1		2.1			ND		ND		ND		ND		ND	
2,3,7,8-TCDD	1746-01-6	ng/kg		ND	1.3		1.3			ND	1.1		6.8		39		150		170		110			NA	1500		240		490		10		19		15		21		ND		
1,2,3,7,8-PeCDF	57117-41-6	ng/kg		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		NA		ND		ND		ND		ND		ND		ND		ND		ND	
2,3,4,7,8-PeCDF	57117-31-4	ng/kg		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		NA		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,3,7,8-PeCDD	40321-76-4	ng/kg		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		NA		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,3,4,7,8-HxCDF	70648-26-9	ng/kg		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		NA		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,3,6,7,8-HxCDF	57117-44-9	ng/kg		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		NA		ND		ND		ND		ND		ND		ND		ND		ND	
2,3,4,6,7,8-HxCDF	60851-34-5	ng/kg		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		NA		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,3,7,8,9-HxCDF	72918-21-9	ng/kg		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		NA		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,3,4,7,8-HxCDD	39227-28-6	ng/kg		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		NA		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,3,6,7,8-HxCDD	57653-85-7	ng/kg		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		NA		ND		ND		ND		ND	18		25		10		11		ND
1,2,3,7,8,9-HxCDD	19408-74-3	ng/kg		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		NA		ND		ND		ND		ND	7		12			ND	5		ND
1,2,3,4,6,7,8-HpCDF	67562-39-4	ng/kg		ND		ND		ND		ND		ND		ND		ND	15		8.7			ND		NA		ND	7.7		12		18		170		14		31		ND		
1,2,3,4,7,8,9-HpCDF	55673-89-7	ng/kg		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		NA		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,3,4,6,7,8-HpCDD	35822-46-9	ng/kg		ND		ND		ND		ND		ND	6.4		11		87		64		19			NA	46		39		87		54		110		59		47		ND		
OCDF	39001-02-0	ng/kg		ND		ND		ND		ND		ND		ND		ND	54		25			ND		NA	15		14		23		18		82		23		37		ND		
OCDD	3268-87-9	ng/kg	11			ND	16		10			ND	46		99		900		560		140			NA	380		210		650		180		330		310		150		ND		
Total TCDF	30402-14-3	ng/kg		ND		ND	1.2			ND		ND	1.2		3.4		40		25		9			NA	71		44		58		12		15		4.9		2.5		ND		
Total TCDD	41903-57-5	ng/kg		ND	1.3		1.3			ND	1.1		6.8		40		160		180		110			NA	1600		260		520		10		19		18		21		ND		
Total PeCDF	30402-15-4	ng/kg		ND		ND		ND		ND		ND		ND		ND	21		16			ND		NA	43		22		23			ND	38			ND		ND			
Total PeCDD	36088-22-9	ng/kg		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		NA	9.4			ND		ND		ND		ND		ND		ND			
Total HxCDF	55684-94-1	ng/kg		ND		ND		ND		ND		ND		ND		ND	12			ND		ND		NA		ND		ND	6		17		87		12		37		ND		
Total HxCDD	34465-46-8	ng/kg		ND		ND		ND		ND		ND		ND		ND	5.5		6.3			ND		NA	20		9.8		20		120		160		51		66		ND		
Total HpCDF	38998-75-3	ng/kg		ND		ND		ND		ND		ND		ND		ND	56		27			ND		NA	11		7.7		33		41		290		36		88		ND		
Total HpCDD	37871-00-4	ng/kg		ND		ND		ND		ND		ND	12		19		140		100		34			NA	77		65		150		94		200		98		77		ND		
TEQ	E17134024	ng/kg	0.011		1.3		1.3		0.01		1.1		6.9		39		150		170		110			NA	1500		240		500			14		26		17		24		ND	

Notes:

Highlighted values indicate a detection.

µg/kg	Micrograms per kilogram	PCB	Polychlorinated biphenyl
ng/kg	Nanograms per kilogram	PeCDD	Pentachlorodibenzo-p-dioxin
BHC	Benzene hexachloride	PeCDF	Pentachlorodibenzofuran
DDD	Dichlorodiphenyldichloroethane	SB	Soil boring
DDE	Dichlorodiphenyldichloroethylene	TCDD	Tetrachlorodibenzo-p-dioxins
DDT	Dichlorodiphenyltrichloroethane	TCDF	Tetrachlorodibenzofuran
FD	Field duplicate	TEQ	Toxic equivalency
HpCDD	Heptachlorodibenzo-p-dioxin		
HpCDF	Heptachlorodibenzofuran		
HxCDD	Hexachlorodibenzo-p-dioxin		
HxCDF	Hexachlorodibenzofuran		
I	Interference present		
J	Estimate		
NA	Not applicable		
NDJ	Not detected estimate		
OCDD	Octachlorodibenzodioxin		
OCDF	Octachlorodibenzofuran		

APPENDIX A

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

TABLE A-1

**POTENTIAL FEDERAL LOCATION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Action	Summary of the Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
FLOODPLAIN					
Construction of temporary staging pile and construction of permanent covers over contaminated building material, soil, and fill	Federal agencies must evaluate potential effects of action they may take in a floodplain and avoid adverse effects to the extent possible. Federal agencies must implement acceptable flood proofing and other flood protection measures for new facilities constructed in a floodplain.	Construction of a structure or facility in a floodplain	Executive Order 11988	Not an ARAR Identified as TBC criteria	Executive Orders are not legally enforceable, and therefore are not identified as potential ARARs. As a result, this Executive Order was evaluated as TBC. The building site is within the 500-year floodplain of the Raccoon River. As a result, this Executive Order is identified as TBC for construction of temporary staging piles to hold and sort building debris prior to being shipped off site for disposal and for the permanent cover over contaminated building debris, soil, and fill. These facilities are necessary for implementation of the removal action and will be designed to prevent washout from a 500 year flood.
Construction of temporary staging pile and construction of permanent cover over contaminated building material, soil, and fill	Modified Executive Order 11988 to establish the Federal Flood Risk Management Standard to improve resilience to flood risks. Redefined "floodplain" to use a higher vertical flood elevation and corresponding horizontal floodplain.	Construction of a structure or facility in a floodplain	Executive Order 13690	Not an ARAR Identified as TBC criteria	Executive Orders are not legally enforceable, and there are not identified as potential ARARs. As a result, this Executive Order was evaluated as TBC criteria. This Executive Order redefined the term floodplain to include the area subject to flooding by the 0.2 percent annual chance of flood (the 500 year floodplain). The building site is within the 500 year floodplain. The other requirements of Executive Order 11988, identify and evaluate practicable alternatives to locating in a floodplain, identify impacts of the proposed action in the floodplain, and minimize, restore, and preserve the floodplain, remain in effect.
Resource Conservation and Recovery Act					
Construction of temporary staging pile and construction of permanent covers over contaminated building material, soil, and fill	A hazardous waste facility within a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout by a 100-year flood, unless the owner or operator can demonstrate procedures in effect that will safely remove the waste, before flood waters can reach the facility.	Construction of new RCRA hazardous waste facility within a 100-year floodplain	40 CFR § 264.18(b)	Relevant and appropriate	The site is within the 500-year floodplain, so these requirements are identified as relevant and appropriate ARARs for construction of temporary staging piles and the permanent cover over contaminated soil and fill.

Notes:

§ Section
ARAR Applicable or relevant and appropriate requirements
CFR Code of Federal Regulations

RCRA Resource Conservation and Recovery Act
TBC To be considered criteria
TCE Trichloroethene

X9025.16.0144.000

TABLE A-2

**POTENTIAL FEDERAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Component of the Removal Action Alternative	Summary of the Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Building Demolition with Off-Site Disposal (Alternative 2)					
Resource Conservation and Recovery Act					
Generate waste	A solid waste exhibits the characteristic of toxicity if, by use of the toxicity characteristic leaching procedure, the extract from a representative sample of the waste contains any contaminant listed in Table 1 in 40 CFR § 261.24, and concentration equals or exceeds the benchmark value for that contaminant listed in Table 1.	Waste	40 CFR § 261.24	Applicable	This regulation is potentially applicable to off-site disposal of building debris that would be waste, and any other waste generated during the removal action. Waste associated with the onsite building foundations of Building 4 and the Maintenance Building is considered RCRA listed waste and would not be subject to this potential ARAR. Demolition waste associated with other buildings is not considered listed waste because it was not contaminated by a spill of listed waste. The demolition waste associated with other buildings would be subject to this potential ARAR and would be characterized to determine if it meets the definition of toxicity characteristic waste.
Generate waste	Discarded commercial chemical products, off-specification species, container residues, and spill residues are considered P-listed hazardous waste and U-listed hazardous waste.	Waste	40 CFR § 261.33	Applicable	This regulation is potentially applicable to off-site disposal of waste. Waste associated with the building foundations of Building 4 and the Maintenance Building is considered P- and U-listed waste.
Generate waste	Person who generates waste shall determine if the waste is a RCRA hazardous waste.	Generator of waste	40 CFR §§ 262.10(a), 262.11	Applicable	These regulations are potentially applicable to off-site disposal of building debris that would be waste, and any other waste generated during the removal action. Waste would be characterized prior to shipment off site for disposal. Waste associated with the onsite building foundations of Building 4 and the Maintenance Building is considered RCRA listed waste. Waste associated with other buildings is not considered listed waste because it was not contaminated by a spill of listed waste. The demolition waste associated with other buildings would be characterized to determine if it meets the definition of RCRA characteristic waste.

TABLE A-2 (Continued)

**POTENTIAL FEDERAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Component of the Removal Action Alternative	Summary of the Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Building Demolition with Off-Site Disposal (Alternative 2)					
Generate waste	Provides requirements for analyzing waste for determining whether waste is hazardous.	Generator of waste	40 CFR § 264.13	Applicable	These regulations are potentially applicable to off-site disposal of building debris that would be waste, and any other waste generated during the removal action. Waste would be characterized prior to shipment off site for disposal.
Temporarily stage debris for off-site disposal	Allows generators to accumulate solid remediation waste in a staging pile designed and operated pursuant to these requirements without triggering LDRs or minimum technology requirements. In addition, activities intended to prepare the waste for subsequent management or treatment are allowed to occur in staging piles.	RCRA hazardous waste temporarily staged for off-site disposal	40 CFR §264.554	Applicable and Relevant and Appropriate	<p>The building debris would be temporarily staged in order to segregate the various waste streams prior to off-site disposal.</p> <p>Waste associated with the onsite building foundations of the Building 4 and of the Maintenance Building are contaminated as a result of spills of listed waste; thus these foundations contain listed waste and must be managed as listed waste. Debris from the building foundations will be temporarily stored in a staging pile prior to off-site disposal. The staging pile regulations would be applicable to the demolition waste associated with Building 4 and the Maintenance Building foundations.</p> <p>Building debris from other buildings does not contain listed waste, but may contain RCRA characteristic waste. Because characterization of the waste is not fully known, the staging pile regulations would be relevant and appropriate requirements for the demolition waste associated with other buildings.</p>
Close temporary staging pile and construct cover over contaminated soil and fill remaining on site	The owner or operator must close the facility in a manner that minimizes need for further maintenance; and controls, minimizes, or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition	RCRA hazardous waste management facility	40 CFR § 264.111	Applicable and Relevant and Appropriate	<p>These requirements are potential ARARs for closing the temporary staging pile.</p> <p>These requirements are also applicable for leaving RCRA listed hazardous waste (soil underneath Building 4 and the Maintenance Building) closed in place and relevant and appropriate for other contamination in the soil closed in place. If necessary, a vegetative cover will be constructed over contamination left in place. However, a vegetative cover may not be required if, based on soil samples collected after the demolition of the buildings and foundations, it is verified that levels of COCs do not exceed action levels.</p>

TABLE A-2 (Continued)

**POTENTIAL FEDERAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Component of the Removal Action Alternative	Summary of the Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Building Demolition with Off-Site Disposal (Alternative 2)					
	products to the ground or surface water or atmosphere.				
Construct cover over contaminated soil and fill remaining on site	Post-closure use of the property on or in which hazardous waste remains after partial or final closure must never be allowed to disturb the integrity of the final cover, liner, or any other components of the containment system, or function of the facility's monitoring systems.	RCRA hazardous waste management facility	40 CFR § 264.117(c)	Applicable and Relevant and Appropriate	These requirements are applicable for leaving RCRA listed hazardous waste (soil underneath Building 4 and the Maintenance Building) closed in place and are relevant and appropriate for leaving other contamination in the soil closed in place. If necessary, a vegetative cover will be constructed over contamination left in place. However, a vegetative cover may not be required if, based on soil samples collected after the demolition of the buildings and foundations, it is verified that levels of COCs do not exceed action levels.
Construct cover over contaminated soil and fill remaining on site	A map must be prepared showing exact location and dimensions of each waste management cell with respect to permanently surveyed benchmarks.	RCRA hazardous waste landfill	40 CFR § 264.309(a)	Applicable and Relevant and Appropriate	These requirements are applicable for leaving RCRA listed hazardous waste (soil underneath Building 4 and the Maintenance Building) closed in place and relevant and appropriate for leaving other contamination in the soil closed in place. If necessary, a vegetative cover will be constructed over contamination left in place. However, a vegetative cover may not be required if, based on soil samples collected after the demolition of the buildings and foundations, it is verified that levels of COCs do not exceed action levels.
Construct cover over contaminated soil and fill remaining on site	Final cover design and construction requirements.	RCRA hazardous waste landfill	40 CFR §264.310	Applicable and Relevant and Appropriate	These requirements are applicable for leaving RCRA listed hazardous waste (soil underneath Building 4 and the Maintenance Building) closed in place and relevant and appropriate for leaving other contamination in soil closed in place. If necessary, a vegetative cover will be constructed over contamination left in place. However, a vegetative cover may not be required if, based on soil samples collected after the demolition of the buildings and foundations, it is verified that levels of COCs do not exceed action levels.

TABLE A-2 (Continued)

**POTENTIAL FEDERAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Component of the Removal Action Alternative	Summary of the Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Building Demolition with Off-Site Disposal (Alternative 2)					
Close temporary staging pile and construct cover over contaminated soil and fill remaining on site	At closure, owner shall remove or decontaminate all waste residues, contaminated containment system components, contaminated subsoils, and structures and equipment contaminated with waste and leachate, and manage them as hazardous waste. If waste is left on site, post-closure care shall be performed in accordance with the closure and post-closure care requirements that apply to landfills.	RCRA hazardous waste pile	40 CFR § 264.258(a)	Applicable and Relevant and Appropriate	These requirements are potential ARARs for closing the temporary staging pile. These requirements are also applicable for leaving RCRA listed hazardous waste (soil underneath Building 4 and the Maintenance Building) closed in place and relevant and appropriate for leaving other contamination in the soil closed in place. If necessary, a vegetative cover will be constructed over contamination left in place. However, a vegetative cover may not be required if, based on soil samples collected after the demolition of the buildings and foundations, it is verified that levels of COCs do not exceed action levels.
Monitor groundwater	Owners and operators of landfills that dispose of hazardous waste must implement a groundwater monitoring program to detect, characterize, and respond to releases to the uppermost aquifer unless the owner or operator is exempt from this requirement, including a finding of no potential for migration of liquid from a regulated unit to the uppermost aquifer during the active life of the regulated unit and the post-closure period.	RCRA hazardous waste landfill	40 CFR §§ 264.90 and 264.91	Applicable	These requirements are applicable to RCRA hazardous waste disposal sites. These regulations require groundwater monitoring unless the owner or operator falls within an exception, including a finding of no potential for migration of liquids into groundwater.
Generate waste	A generator of waste shall determine if the waste has to be treated before it can be land disposed, which may occur concurrently with the hazardous waste determination required in 40 CFR § 262.11.	Waste	40 CFR § 268.7	Applicable	These regulations are potentially applicable to waste, including the building debris, to be sent off site for disposal. The waste would be characterized and a determination regarding required treatment would be made prior to off-site disposal.

TABLE A-2 (Continued)

**POTENTIAL FEDERAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Component of the Removal Action Alternative	Summary of the Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Building Demolition with Off-Site Disposal (Alternative 2)					
Generate waste	The initial generator of a waste shall determine each EPA hazardous waste number (waste code) in order to determine the applicable treatment standards, which may occur concurrently with the hazardous waste determination required in 40 CFR § 262.11.	Waste	40 CFR § 268.9	Applicable	These regulations are potentially applicable to waste, including the building debris, to be sent off site for disposal. The waste would be characterized and a determination would be made regarding required treatment prior to off-site disposal.
Generate waste	EPA may grant variance from an LDR treatment standard.	RCRA hazardous waste subject to LDRs	40 CFR § 268.44	Applicable	These regulations are potentially applicable to waste, including the building debris to be sent off site for disposal that contains the listed waste or meets the definition of RCRA characteristic waste. If necessary and appropriate, a determination may be made that a treatment variance is appropriate.
Generate waste	Treatment standards for hazardous debris.	RCRA hazardous waste subject to LDRs	40 CFR § 268.45	Applicable	Hazardous debris must be treated prior to land disposal unless, pursuant to 40 CFR § 261.3(f)(2), the debris no longer contains hazardous waste or the debris is treated to the waste-specific treatment standards specified in 40 CFR § 268.45.
Clean Air Act					
Building demolition	Owner or operator of a demolition or renovation activity must thoroughly inspect the affected facility where the demolition will occur for presence of asbestos. If asbestos is found, the owner or operator must comply with the notification requirements of 40 CFR § 61.145(b) and the procedures for asbestos emission control specified in 40 CFR § 61.145(c).	Demolition of any institutional, commercial, public, industrial, or residential structure with less than four units	40 CFR § 61.145	Applicable	The substantive provisions of the NESHAPS for asbestos are applicable to demolition of the building. An asbestos survey will be completed prior to demolition of the building. If asbestos-containing materials are found, the demolition must comply with the substantive procedures in 40 CFR § 61.145(c).

TABLE A-2 (Continued)

**POTENTIAL FEDERAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Component of the Removal Action Alternative	Summary of the Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Building Demolition with Off-Site Disposal (Alternative 2)					
Building demolition	Each owner or operator of a source covered under §§ 61.144, 61.145, 61.146, and 61.147 must (1) discharge no visible emissions to the outside air during collection, processing, packaging, and transporting; (2) deposit the asbestos-containing waste at the waste disposal site as soon as is practical; (3) mark vehicles used to transport asbestos-containing waste; (4) maintain transportation records; and (5) make records available for inspection.	Owner or operator of a source of asbestos emissions (including a source regulated under 40 CFR § 61.145)	40 CFR § 61.150	Applicable	The substantive provisions of the NESHAPs for asbestos disposal are applicable to asbestos-containing waste identified in the building demolition.
Toxic Substances Control Act					
PCB remediation waste	For purposes of cleaning, decontaminating, or removing PCB remediation waste, the cleanup level for bulk PCB remediation waste in high occupancy areas is equal to or less than 1 mg/kg without further use restrictions. Concentrations up to 10 mg/kg may remain on site in high occupancy areas if the concentrations are covered by a cap meeting the requirements of 40 CFR § 761.61(a)(7) and (a)(8).	PCB remediation waste	40 CFR § 761.61(a)(4)(i)(A)	Relevant and appropriate	In the promulgation of the TSCA rule at 40 CFR § 761.61, EPA stated that Part 761 does not bind other cleanup programs such as CERCLA or RCRA; however, EPA expects that CERCLA cleanups would typically comply with one of the three cleanup options provided in § 761.61. Therefore, this regulation, which is within Part 761, is not identified as applicable, but is identified as relevant and appropriate to PCBs that may remain on site after demolition of the buildings and foundation. Concentrations of PCBs remaining on site must comply with requirements for PCB remediation waste. Therefore, under Alternative 2, concentrations of PCBs above 1 mg/kg will be removed from the site and disposed of off-site.

TABLE A-2 (Continued)

**POTENTIAL FEDERAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Component of the Removal Action Alternative	Summary of the Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Building Demolition with Off-Site Disposal (Alternative 2)					
Building demolition	PCB bulk product waste must be disposed of in accordance with (1) performance-based disposal, (2) disposal in solid waste landfills, or (3) risk-based disposal approval.	PCB bulk product waste means waste derived from manufactured products containing PCBs in a non-liquid state, at any concentration at time of designation for disposal ≥ 50 ppm PCBs	40 CFR § 761.62(b)	Relevant and appropriate	In the promulgation of the TSCA rule at 40 CFR § 761.61, EPA stated that Part 761 does not bind other cleanup programs such as CERCLA or RCRA; however, EPA expects that CERCLA cleanups would typically comply with one of the three cleanup options provided in § 761.61. Therefore, this regulation, which is within Part 761, is not identified as applicable, but is identified as relevant and appropriate to PCBs present in building materials from manufactured products (not as a result of a spill). EPA has determined that the PCB-contaminated building material is PCB bulk product waste because at the time of designation for disposal, the PCB material is still attached to the building.
Building demolition	Requirements for sampling non-liquid, non-metal PCB bulk product waste for purposes of characterization for PCB disposal in accordance with 40 CFR § 761.62.	PCB bulk product waste means waste derived from manufactured products containing PCBs in a non-liquid state, at any concentration at time of designation for disposal ≥ 50 ppm PCBs	40 CFR §§ 761.340 through 761.359 (Subpart R)	Relevant and appropriate	PCB bulk product waste is present in the building materials. Sampling the building materials for PCB bulk product waste would be completed according to these requirements.

TABLE A-2 (Continued)

**POTENTIAL FEDERAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Component of the Removal Action Alternative	Summary of the Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Building Demolition with Off-Site Disposal (Alternative 2)					
Building demolition	Procedure for double wash/rinse method for decontaminating non-porous surfaces.	PCB bulk product waste means waste derived from manufactured products containing PCBs in a non-liquid state, at any concentration at time of designation for disposal ≥ 50 ppm PCBs	40 CFR §§ 761.360 through 761.378 (Subpart S)	Relevant and appropriate	PCB bulk product waste is present in the building materials. Non-porous surfaces of PCB bulk product waste may be decontaminated using this method prior to disposal.
Clean Water Act					
Building demolition and construction of the cap	Construction activities that disturb 1 acre or more must use best management practices to control storm water discharges.	Construction activities affecting at least 1 acre.\	Clean Water Act § 402 40 CFR §122.44(k)(2) and (4)	Applicable	Building demolition and construction of the cap will affect at least 1 acre, so the storm water discharge requirements are applicable. Best management practices will be used to control storm water discharge to nearby surface water bodies. See Table 3, Potential State ARARs, for a discussion of compliance with these Clean Water Act ARARs.

TABLE A-2 (Continued)

**POTENTIAL FEDERAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Action	Summary of the Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Building Demolition with On-site Containment (Alternative 3)					
Resource Conservation and Recovery Act					
Generate waste	A solid waste exhibits the characteristic of toxicity if, by application of the toxicity characteristic leaching procedure, the extract from a representative sample of the waste contains contaminant listed in Table 1 at concentration equaling or exceeding the benchmark value for that contaminant listed in Table 1.	Waste	40 CFR § 261.24	Applicable	This regulation is potentially applicable to off-site disposal of waste generated during the removal action. Waste associated with the foundations of Building 4 and the Maintenance Building is considered RCRA listed waste and would not be subject to this potential ARAR. Waste associated with other buildings is not considered listed waste because it was not contaminated by a spill of listed waste. The demolition waste associated with other buildings would be subject to this potential ARAR and would be characterized to determine if it meets the definition of toxicity characteristic waste.
Generate waste	Discarded commercial chemical products, off-specification species, container residues, and spill residues are considered P-listed hazardous waste and U-listed hazardous waste.	Waste	40 CFR § 261.33	Applicable	This regulation is potentially applicable to off-site disposal of waste generated during the removal action. Waste associated with the foundations of Building 4 and the Maintenance Building is considered P- and U-listed waste.
Construct covers over crushed building debris left on site	The owner or operator must close the facility in a manner that minimizes need for further maintenance; and controls, minimizes, or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface water or atmosphere.	RCRA hazardous waste management facility	40 CFR § 264.111	Applicable and relevant and appropriate	These requirements are applicable for leaving RCRA listed hazardous waste (foundations of Building 4 and of the Maintenance Building) closed in place over the southern portion of the site and are relevant and appropriate for leaving other waste and contamination closed in place over the northern portion of the site.

TABLE A-2 (Continued)

**POTENTIAL FEDERAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Action	Summary of the Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Building Demolition with On-site Containment (Alternative 3)					
Construct covers over crushed building debris left on site	Post-closure use of the property on or in which hazardous waste remains after partial or final closure must never be allowed to disturb the integrity of the final cover, liner, or any other components of the containment system, or function of the facility's monitoring systems.	RCRA hazardous waste management facility	40 CFR § 264.117(c)	Applicable and relevant and appropriate	These requirements are applicable for leaving RCRA listed hazardous waste (foundations of Building 4 and of the Maintenance Building) closed in place over the southern portion of the site and are relevant and appropriate for leaving other waste and contamination closed in place over the northern portion of the site.
Construct covers over crushed building debris left on site	A map must be prepared showing the exact location and dimensions of each waste management cell with respect to permanently surveyed benchmarks.	RCRA hazardous waste landfill	40 CFR § 264.309(a)	Applicable and relevant and appropriate	These requirements are applicable for leaving RCRA listed hazardous waste (foundations of Building 4 and of the Maintenance Building) closed in place over the southern portion of the site and are relevant and appropriate for leaving other waste and contamination closed in place over the northern portion of the site.
Construct cover over crushed building debris left on site	Final cover design and construction requirements.	RCRA hazardous waste landfill	40 CFR §264.310	Applicable	These requirements are applicable for leaving RCRA listed hazardous waste (foundations of Building 4 and of the Maintenance Building) closed in place over the southern portion of the site.
Monitor groundwater	Owners and operators of landfills that dispose of hazardous waste must implement a groundwater monitoring program to detect, characterize, and respond to releases to the uppermost aquifer unless the owner or operator is exempt from this requirement, including a finding of no potential for migration of liquid from a regulated unit to the uppermost aquifer during the active life of the regulated unit and the post-closure period.	RCRA hazardous waste landfill	40 CFR §§ 264.90 and 264.91	Applicable	These requirements are applicable to RCRA hazardous waste disposal sites, which would include the southern portion of the site. These regulations require groundwater monitoring unless the owner or operator falls within an exception, including a finding of no potential for migration of liquids into groundwater.

TABLE A-2 (Continued)

**POTENTIAL FEDERAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Action	Summary of the Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Building Demolition with On-site Containment (Alternative 3)					
Generate waste	Treatment standards for hazardous debris.	RCRA hazardous waste subject to LDRs	40 CFR § 268.45	Applicable	Some hazardous debris would be sent off-site for disposal. Hazardous debris must be treated prior to off-site land disposal unless, pursuant to 40 CFR § 261.3(f)(2), the debris no longer contains hazardous waste or the debris is treated to the waste-specific treatment standards specified in 40 CFR § 268.45.
Clean Air Act					
Building demolition	Owner or operator of a demolition or renovation activity must thoroughly inspect the affected facility where the demolition will occur for presence of asbestos. If asbestos is found, the owner or operator must comply with the notification requirements of 40 CFR § 61.145(b) and the procedures for asbestos emission control of 40 CFR § 61.145(c).	Demolition of any institutional, commercial, public, industrial, or residential structure with less than four units	40 CFR § 61.145	Applicable	The substantive provisions of the NESHAPS for asbestos are applicable to demolition of the building. An asbestos survey will be completed prior to demolition of the building. If asbestos-containing materials are found, the demolition must comply with the substantive procedures in 40 CFR § 61.145(c).
Building demolition	Each owner or operator of a source covered under §§ 61.144, 61.145, 61.146, and 61.147 must (1) discharge no visible emissions to the outside air during collection, processing, packaging, and transporting; (2) deposit the asbestos-containing waste at the waste disposal site as soon as is practical; (3) mark vehicles used to transport asbestos-containing waste; (4) maintain transportation records; and (5) make records available for inspection.	Owner or operator of a source of asbestos emissions (including a source regulated under 40 CFR § 61.145)	40 CFR § 61.150	Applicable	The substantive provisions of the NESHAPS for asbestos disposal are applicable to asbestos-containing waste identified in the building demolition. An asbestos survey will be completed prior to demolition of the building. If asbestos-containing materials are found, these will be removed and disposed of off site.

TABLE A-2 (Continued)

**POTENTIAL FEDERAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Action	Summary of the Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Building Demolition with On-site Containment (Alternative 3)					
Toxic Substances Control Act					
PCB remediation waste	The cleanup level for bulk PCB remediation waste in low occupancy areas is less than or equal to 25 mg/kg. Concentrations between 25 and 50 mg/kg may remain on site if the site is secured by a fence and marked with a sign. Concentrations between 25 and 100 mg/kg may remain on site if the site is covered with a cap meeting the requirements of paragraphs 40 CFR § 761.61(a)(7) and (a)(8).	PCB remediation waste	40 CFR § 761.61(a)(4)(i)(B)	Relevant and appropriate	In the promulgation of the TSCA rule at 40 CFR § 761.61, EPA stated that Part 761 does not bind other cleanup programs such as CERCLA or RCRA; however, EPA expects that CERCLA cleanups would typically comply with one of the three cleanup options provided in § 761.61. This regulation, which is within Part 761, is not identified as applicable, but is identified as relevant and appropriate to PCBs that may remain on site after demolition of the buildings and foundation. Concentrations of PCBs remaining on site must comply with requirements for PCB remediation waste. Therefore, under Alternative 3, concentrations of PCBs less than 50 mg/kg will be disposed of on-site under the RCRA cover, which would also meet TSCA cover requirements and the site will be restricted to low occupancy reuse.
PCB waste from building demolition	Any person designing and constructing a cap must do so in accordance with 40 CFR § 264.310(a) and ensure that it complies with the permeability, sieve, liquid limit, and plasticity index parameters in § 761.75(b)(1)(ii) through (b)(1)(v). A cap of compacted soil shall have a minimum thickness of 10 inches; a concrete or asphalt cap shall have a minimum thickness of 6 inches. A cap must be of sufficient strength to maintain its effectiveness and integrity when exposed to the environment.	PCB remediation waste at concentrations ≥ 50 ppm PCBs	40 CFR §§ 761.61(a)(7), 761.65(b)(1)(i) through (b)(1)(v)	Relevant and appropriate	In promulgation of the TSCA rule at 40 CFR § 761.61, EPA stated that Part 761 does not bind other cleanup programs such as CERCLA or RCRA; however, EPA expects that CERCLA cleanups would typically comply with one of the three cleanup options provided in § 761.61. Also, the PCBs found at the building demolition site are not from the release of PCBs as PCB remediation waste. Instead, the PCBs found at the building demolition site are PCB bulk product waste. Therefore, these regulations are not identified as applicable, but are identified as relevant and appropriate to PCBs present in a bulk product waste. PCB bulk product waste with concentrations of PCBs exceeding 50 ppm will be disposed of off site. PCB bulk product waste with concentrations at or less than 50 ppm will remain on site, under the RCRA cover. The cover over the PCB bulk product waste and RCRA hazardous waste designed to meet the RCRA requirements, which would also meet these TSCA cover requirements.

TABLE A-2 (Continued)

**POTENTIAL FEDERAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Action	Summary of the Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Building Demolition with On-site Containment (Alternative 3)					
PCB waste from building demolition	When a cleanup activity under this section includes use of a fence or a cap, the owner of the site must maintain the fence or cap in perpetuity.	PCB remediation waste at concentrations \geq 50 ppm PCBs	40 CFR § 761.61(a)(8)	Relevant and appropriate	In promulgation of the TSCA rule at 40 CFR § 761.61, EPA stated that Part 761 does not bind other cleanup programs such as CERCLA or RCRA; however, EPA expects that CERCLA cleanups would typically comply with one of the three cleanup options provided in § 761.61. Also, the PCBs found at the building demolition site are not from the release of PCBs as PCB remediation waste. Instead, the PCBs found at the building demolition site are PCB bulk product waste. Therefore, these regulations are not identified as applicable, but are identified as relevant and appropriate to PCBs present in bulk product waste. PCB bulk product waste with concentrations of PCBs exceeding 50 ppm will be disposed of off site. PCB bulk product waste with concentrations less than 50 ppm will remain on site, under the RCRA cover. The cover over the PCB bulk product waste and RCRA hazardous waste designed to meet the RCRA requirements, which would also meet these TSCA cover requirements.
PCB waste from building demolition	PCB bulk product waste must be disposed of in accordance with (1) performance-based disposal, (2) disposal in solid waste landfills, or (3) risk-based disposal approval.	PCB bulk product waste means waste derived from manufactured products containing PCBs in a non-liquid state at any concentration at time of designation for disposal \geq 50 ppm PCBs	40 CFR § 761.62(c)	Relevant and appropriate	In promulgation of the TSCA rule at 40 CFR § 761.61, EPA stated that Part 761 does not bind other cleanup programs such as CERCLA or RCRA; however, EPA expects that CERCLA cleanups would typically comply with one of the three cleanup options provided in § 761.61. Therefore, this regulation, which is within Part 761, is not identified as applicable, but is identified as relevant and appropriate to PCBs bulk product waste. PCB bulk product waste with concentrations of PCBs exceeding 50 ppm will be disposed of off site. PCB bulk product waste with concentrations less than 50 ppm will remain on site, under the cover.

TABLE A-2 (Continued)

**POTENTIAL FEDERAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Action	Summary of the Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Building Demolition with On-site Containment (Alternative 3)					
Building demolition	Requirements for sampling non-liquid, non-metal PCB bulk product waste for purposes of characterization for PCB disposal in accordance with 40 CFR § 761.62.	PCB bulk product waste means waste derived from manufactured products containing PCBs in a non-liquid state, at any concentration at time of designation for disposal ≥ 50 ppm PCBs	40 CFR §§ 761.340 through 761.359 (Subpart R)	Relevant and appropriate	PCB bulk product waste is present in the building materials. Sampling the building materials for PCB bulk product waste would be completed according to these requirements.
Building demolition	Procedure for double wash/rinse method for decontaminating non-porous surfaces.	PCB bulk product waste means waste derived from manufactured products containing PCBs in a non-liquid state, at any concentration at time of designation for disposal ≥ 50 ppm PCBs	40 CFR §§ 761.360 through 761.378 (Subpart S)	Relevant and appropriate	PCB bulk product waste is present in the building materials. Non-porous surfaces of PCB bulk product waste may be decontaminated using this method prior to disposal.

TABLE A-2 (Continued)

**POTENTIAL FEDERAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Action	Summary of the Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Building Demolition with On-site Containment (Alternative 3)					
Clean Water Act					
Construct covers over crushed building debris left on site	Construction activity that disturbs 1 acre or more must use best management practices to control stormwater discharges.	Construction activities encompassing at least 1 acre	Clean Water Act § 402 40 CFR §122.44(k)(2) and (4)	Applicable	Demolition and construction of the covers will affect at least 1 acre, so the stormwater discharge requirements are applicable. Best management practices will be used to control stormwater discharge to nearby surface water bodies. See Table 3, Potential State ARARs, for a discussion of compliance with these Clean Water Act ARARs.

Notes:

§	Section	RCRA	Resource Conservation and Recovery Act
ARAR	Applicable or relevant and appropriate requirement	TBC	To be considered criteria
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	TCE	Trichloroethene
CFR	<i>Code of Federal Regulations</i>	TSCA	Toxic Substances Control Act
COC	Chemical of concern		
EPA	Environmental Protection Agency		
IC	Institutional controls		
LDR	Land disposal restriction		
mg/kg	Milligrams per kilogram		
NESHAPS	National Emission Standards for Hazardous Air Pollutants		
PCB	Polychlorinated biphenyl		
ppm	Parts per million		

TABLE A-3

**POTENTIAL STATE ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Building Demolition with Off-site Disposal (Alternative 2)					
Clean Water Act					
Building demolition and construction of cover	Construction activities that disturb 1 acre or more must use best management practices to control stormwater discharges.	Construction activities that affect 1 acre or more	IAC § 567-64.4(2)	Applicable	<p>Building demolition and construction of the cover over contaminated soil and fill will affect more than 1 acre, so the storm water discharge requirements are applicable. Best management practices will be used to control storm water discharge to nearby surface water bodies.</p> <p>Pursuant to CERCLA § 121(e), permits are not required for the portions of the removal action that occur entirely on site. The storm water discharge will occur entirely on site; therefore, a permit to discharge the storm water is not required. However, the substantive provisions of Iowa General Permit 2 (Storm Water Management for Construction Activities) will be applied as a means of complying with Clean Water Act requirements.</p>
Special Waste Authorizations (Alternative 2)					
Dispose of PCB building material	Wastes with PCB concentrations equal to or greater than 50 ppm shall not be authorized for disposal at a landfill.	PCB waste	IAC §567-109.5(2)(c)	Applicable	<p>The buildings contain PCB bulk product waste that will be disposed of off-site. Pursuant to 40 CFR §761.62(b), PCB bulk product waste may be disposed of: (1) using a performance-based disposal; (2) in a solid waste landfill, or (3) using a risk-based disposal. This potential state ARAR does not allow PCB bulk waste with concentrations greater than 50 ppm to be disposed of in a solid waste landfill. Therefore, this potential state ARAR was determined to be more stringent than the potential federal ARAR at 40 CFR § 761.62(b).</p> <p>The PCB bulk product waste will be characterized and if it contains concentrations at or above 50 ppm, it will be disposed of at a TSCA-approved or RCRA hazardous waste landfill. PCB bulk product waste with concentrations below 50 ppm will be disposed of at a solid waste landfill.</p>

TABLE A-3 (Continued)

**POTENTIAL STATE ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Building Demolition with Off-site Disposal (Alternative 2)					
Iowa Land Recycling Program and Response Action Standards					
Technological controls	The purpose of a technological control is to effectively sever a pathway by use of technologies such that an applicable receptor could not be exposed to hazardous substances at concentrations above respective applicable target risk levels. Proposal for any technological control as a permanent response action option that would not reduce contaminant concentrations to at or below target risk levels must establish that the pathway to a receptor would be permanently severed or controlled.	A contaminated site enrolled in the Land Recycling Program	IAC § 137.7(1)	Relevant and appropriate	These requirements are not applicable because neither the building nor the site is enrolled in the Land Recycling Program. These requirements are potentially relevant and appropriate to the cover evaluated in Alternative 2 that would be used to prevent exposure to contaminated soil and fill remaining on site.
Impose an IC	The purpose of an IC is to restrict access to or use of an affected area such that current or future receptors could not be exposed to hazardous substances. ICs can include: (1) a state or federal law or regulation, (2) a local ordinance, (3) a recorded contractual obligation, (4) informational devices, or (5) an environmental covenant pursuant to the Uniform Environmental Covenants Act.	A contaminated site enrolled in the Land Recycling Program	IAC § 137.7(2)	Relevant and appropriate	These requirements are not applicable to the ICs under evaluation because neither the building nor the site is enrolled in the Land Recycling Program. These requirements are potentially relevant and appropriate for establishing the ICs necessary to prevent human health exposure to contaminated soil and fill remaining on site.

TABLE A-3 (Continued)

**POTENTIAL STATE ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Building Demolition with Off-site Disposal (Alternative 2)					
Modify or terminate an IC or technological control	A participant or owner of property subject to an IC may seek approval from the department for removal, discontinuance, modification, or termination of an IC.	A contaminated site enrolled in the Land Recycling Program	IAC § 137.7(8)	Relevant and appropriate	These requirements are not applicable to the ICs under evaluation because neither the building nor the site is enrolled in the Land Recycling Program. These requirements are potentially relevant and appropriate for modifying or terminating ICs imposed on the site to prevent exposure to contaminated building debris remaining on site.
Uniform Environmental Covenants Act					
Prohibit future uses of or activities at the site	Land use and activity restrictions must be described and embodied in an environmental covenant recorded in every county in which any portion of the real property subject to the environmental covenant is located.	A land use or activity restriction necessary to prevent exposure to contamination	Title XI, Iowa Code, Chapter 455I	Applicable	Land use and activity restrictions are necessary to prevent exposure to contaminated building debris remaining on site, and to maintain the integrity of the final cover.

TABLE A-3 (Continued)

**POTENTIAL STATE ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Building Demolition with On-site Containment (Alternative 3)					
Clean Water Act					
Building demolition and construction of covers	Construction activities that disturb 1 acre or more must use best management practices to control stormwater discharges.	Construction activities that affect 1 acre or more	IAC § 567-64.4(2)	Applicable	Building demolition and construction of the covers will affect more than 1 acre, so the storm water discharge requirements are applicable. Best management practices will be used to control storm water discharge to nearby surface water bodies. Pursuant to CERCLA § 121(e), permits are not required for the portions of the removal action that occur entirely on site. The storm water discharge will occur entirely on site; therefore, a permit to discharge the storm water is not required. However, the substantive provisions of Iowa General Permit 2 (Storm Water Management for Construction Activities) will be used as a means of complying with Clean Water Act requirements.
Special Waste Authorizations (Alternative 3)					
Dispose of PCB building material	Wastes with PCB concentrations equal to or greater than 50 ppm shall not be authorized for disposal at a landfill.	PCB waste	IAC §567-109.5(2)(c)	Applicable	<p>The buildings contain PCB bulk product waste that will be disposed of off-site. Pursuant to 40 CFR §761.62(b), PCB bulk product waste may be disposed of: (1) using a performance-based disposal; (2) in a solid waste landfill, or (3) using a risk-based disposal. This potential state ARAR does not allow PCB bulk waste with concentrations greater than 50 ppm to be disposed of in a solid waste landfill. Therefore, this potential state ARAR was determined to be more stringent than the potential federal ARAR at 40 CFR § 761.62(b).</p> <p>The PCB bulk product waste will be characterized and if it contains concentrations at or above 50 ppm, it will be disposed of at a TSCA-approved or RCRA hazardous waste landfill. PCB bulk product waste with concentrations below 50 ppm will be disposed under the RCRA cap in the southern portion of the site.</p>

TABLE A-3 (Continued)

**POTENTIAL STATE ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Building Demolition with On-site Containment (Alternative 3)					
Iowa Land Recycling Program and Response Action Standards					
Technological controls	The purpose of a technological control is to effectively sever a pathway by use of technologies such that an applicable receptor could not be exposed to hazardous substances at concentrations above respective applicable target risk levels. Proposal for any technological control as a permanent response action option that would not reduce contaminant concentrations to at or below target risk levels must establish that the pathway to a receptor would be permanently severed or controlled.	A contaminated site enrolled in the Land Recycling Program	IAC § 137.7(1)	Relevant and appropriate	These requirements are not applicable because neither the building nor the site is enrolled in the Land Recycling Program. These requirements are potentially relevant and appropriate to the cover evaluated in Alternative 3 that would be used to prevent exposure to contaminated building debris remaining on site.
Impose an IC	The purpose of an IC is to restrict access to or use of an affected area such that current or future receptors could not be exposed to hazardous substances. ICs can include: (1) a state or federal law or regulation, (2) a local ordinance, (3) a recorded contractual obligation, (4) informational devices, or (5) an environmental covenant pursuant to the Uniform Environmental Covenants Act.	A contaminated site enrolled in the Land Recycling Program	IAC § 137.7(2)	Relevant and appropriate	These requirements are not applicable to the ICs under evaluation because neither the building nor the site is enrolled in the Land Recycling Program. These requirements are potentially relevant and appropriate for establishing the ICs necessary to prevent human health exposure to contaminated building debris remaining on site.

TABLE A-3 (Continued)

**POTENTIAL STATE ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Building Demolition with On-site Containment (Alternative 3)					
Modify or terminate an IC or technological control	A participant or owner of property subject to an IC may seek approval from the department for removal, discontinuance, modification, or termination of an IC.	A contaminated site enrolled in the Land Recycling Program	IAC § 137.7(8)	Relevant and appropriate	These requirements are not applicable to the ICs under evaluation because neither the building nor the site is enrolled in the Land Recycling Program. These requirements are potentially relevant and appropriate for modifying or terminating ICs imposed on the site to prevent exposure to contaminated building debris remaining on site.
Uniform Environmental Covenants Act					
Prohibit future uses of or activities at the site	Land use and activity restrictions must be described and embodied in an environmental covenant recorded in every county in which any portion of the real property subject to the environmental covenant is located.	A land use or activity restriction necessary to prevent exposure to contamination	Title XI, Iowa Code, Chapter 455I	Applicable	Land use and activity restrictions are necessary to prevent exposure to contaminated building debris remaining on site, and to maintain the integrity of the final cover.

Notes:

§	Section
ARAR	Applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response,
CFR	<i>Code of Federal Regulations</i>
EPA	U.S. Environmental Protection Agency
IAC	<i>Iowa Administrative Code</i>
IC	Institutional control
ppm	Parts per million
RCRA	Resource Conservation and Recovery Act
TCE	Trichloroethene

APPENDIX B
COST ESTIMATE

**Appendix B
Building Demolition
Des Moines TCE Site
Des Moines, Iowa**

TABLE B-1			
COST SUMMARY			
Alternative	Option	Description	Total
2A	NA	Building Demolition with Off-site Disposal (25% Hazardous)	\$ 11,127,000
2B	NA	Building Demolition with Off-site Disposal (75% Hazardous)	\$ 12,846,000
3	NA	Building Demolition with On-site Containment (25-75% Hazardous)	\$ 13,939,000

Appendix B
Building Demolition
Des Moines TCE Site
Des Moines, Iowa

ALTERNATIVE 2A
BUILDING DEMOLITION WITH OFF-SITE DISPOSAL (25% HAZARDOUS)

Table B-2				
Alternative 2A - Building Demolition with Off-site Disposal (25% Hazardous)				
Source	Description	Subtotal	Contingency	Total (Rounded)
Table B-3	Design and Construction	\$ 8,559,266	\$ 2,567,780	\$ 11,127,000
Contingency		30%	\$ 2,567,780	
Total			\$	11,127,000

**Appendix B
Building Demolition
Des Moines TCE Site
Des Moines, Iowa**

Capital Cost

Location factor (for zip code 433xx)

ECHOS	1
Get-a-Quote	1.04

Note: Location factor applied only to national average unit costs; not applied to local unit costs such as from vendors or Means.

Overhead and Profit (O&P)

General	25%	Typical general contractor overhead and profit
Means	-	NA
RACER	25%	NA
Contractor quote	5%	Prime contractor markup
Professional judgment	-	Not marked-up

Inflation

1.64%	Avg. annual inflation from 2010 to 2017
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Table B-3					
Alternative 2A - Building Demolition with Off-site Disposal (25% Hazardous)					
Item	Description	Quantity	Unit	Unit Price (Incl. O&P)	Total Cost
	Construction Subtotal				\$ 6,820,942
	Site Preparation				\$ 15,246
1	Temporary facilities	1.0	ls	\$ 15,246.00	\$ 15,246
	Asbestos Survey				\$ 8,990
2	Asbestos survey	1.0	ls	\$ 8,990.28	\$ 8,990
	Equipment Decontamination				\$ 84,386
3	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 71,948.09	\$ 71,948
4	Transportation and disposal (2,750 gallons of wastewater)	1.0	ls	\$ 12,438.15	\$ 12,438
	Asbestos Removal and Disposal				\$ 534,072
5	Asbestos removal - Production Building	1.0	ls	\$ 175,703.08	\$ 175,703
6	Asbestos removal - Building 1	1.0	ls	\$ 44,988.86	\$ 44,989
7	Asbestos removal - Building 2	1.0	ls	\$ 216,245.87	\$ 216,246
8	Asbestos removal - Building 3	1.0	ls	\$ 97,134.31	\$ 97,134
	PCB Removal and Disposal (Insulation)				\$ 754,624
9	PCB removal - Production Building	1.0	ls	\$ 216,363.38	\$ 216,363
10	PCB removal - Building 1	1.0	ls	\$ 20,856.37	\$ 20,856
11	PCB removal - Building 2	1.0	ls	\$ 84,477.92	\$ 84,478
12	PCB removal - Building 3	1.0	ls	\$ 137,953.45	\$ 137,953
13	PCB disposal	1,043.0	ton	\$ 282.81	\$ 294,974
	Metal Decontamination				\$ 99,668
14	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 87,229.76	\$ 87,230
15	Transportation and disposal (2,750 gallons of wastewater)	1.0	ls	\$ 12,438.15	\$ 12,438
	Building Demolition				\$ 732,764
16	Building demolition - Production Building	1.0	ls	\$ 521,226.47	\$ 521,226
17	Building demolition - Building 1	1.0	ls	\$ 14,968.25	\$ 14,968
18	Building demolition - Building 2	1.0	ls	\$ 142,045.63	\$ 142,046
19	Building demolition - Building 3	1.0	ls	\$ 53,087.26	\$ 53,087
20	Building demolition - Walkway	1.0	ls	\$ 1,436.95	\$ 1,437

Appendix B
Building Demolition
Des Moines TCE Site
Des Moines, Iowa

Table B-3					
Alternative 2A - Building Demolition with Off-site Disposal (25% Hazardous)					
Item	Description	Quantity	Unit	Unit Price (Incl. O&P)	Total Cost
	Slab Demolition				\$ 519,363
21	Slab demolition - Production Building	1.0	ls	\$ 249,575.67	\$ 249,576
22	Slab demolition - Building 1	1.0	ls	\$ 6,109.47	\$ 6,109
23	Slab demolition - Building 2	1.0	ls	\$ 57,971.81	\$ 57,972
24	Slab demolition - Building 3	1.0	ls	\$ 31,167.14	\$ 31,167
25	Slab demolition - Maintenance Building	1.0	ls	\$ 18,700.78	\$ 18,701
26	Slab demolition - Buildings 4 and 5	1.0	ls	\$ 155,838.21	\$ 155,838
	Waste Characterization				\$ 358,895
27	Sampling and analysis for pesticides, PCBs, VOCs, and dioxins (200 building debris samples [4 samples per 1,000 cy] and 100 wastewater samples)	1.0	ls	\$ 358,894.61	\$ 358,895
	Transportation and Disposal				\$ 2,552,938
28	Dump charges (non-hazardous waste)	28,356.0	ton	\$ 39.90	\$ 1,131,404
29	Load and haul (non-hazardous waste)	28,356.0	ton	\$ 22.37	\$ 634,182
30	Transportation and disposal (hazardous)	2,784.0	ton	\$ 282.81	\$ 787,352
	Capping				\$ 1,097,064
31	Seeding, vegetative cover	7.9	ac	\$ 5,158.60	\$ 40,805
32	Topsoil, 6 inches deep	7,971.3	lcy	\$ 52.69	\$ 419,982
33	Fill, 6 inches deep	7,971.3	cy	\$ 36.04	\$ 287,297
34	Clay, low permeability, 6 inches deep	8,927.9	cy	\$ 39.09	\$ 348,980
	Measurement				\$ 62,932
35	Pre-construction surveying	14.0	days	\$ 2,247.59	\$ 31,466
36	Post-construction surveying	14.0	days	\$ 2,247.59	\$ 31,466
Construction subtotal				\$	6,820,942
Construction Contractor Mobe/Demobe, Site Prep and Submittals				10%	\$ 682,094
Pre-design investigation				10%	\$ 682,094
Engineering design				18%	\$ 1,227,770
Project management and construction oversight				7%	\$ 477,466
Recycling of metal (14,790 tons at \$90 per ton)					\$ (1,331,100)
Capital Cost Subtotal				\$	8,559,266

Notes:

ac Acre
cy Cubic yard
lcy Linear cubic yard
ls Lump sum

Appendix B
Building Demolition
Des Moines TCE Site
Des Moines, Iowa

ALTERNATIVE 2B
BUILDING DEMOLITION WITH OFF-SITE DISPOSAL (75% HAZARDOUS)

Table B-4				
Alternative 2B - Building Demolition with Off-site Disposal (75% Hazardous)				
Source	Description	Subtotal	Contingency	Total (Rounded)
Table B-5	Design and Construction	\$ 9,881,620	\$ 2,964,486	\$ 12,846,000
Contingency		30%	\$ 2,964,486	
Total				\$ 12,846,000

**Appendix B
Building Demolition
Des Moines TCE Site
Des Moines, Iowa**

Capital Cost

Location factor (for zip code 433xx)

ECHOS	1
Get-a-Quote	1.04

Note: Location factor applied only to national average unit costs; not applied to local unit costs such as from vendors or Means.

Overhead and Profit (O&P)

General	25%	Typical general contractor overhead and profit
Means	-	NA
RACER	25%	NA
Contractor quote	5%	Prime contractor markup
Professional judgment	-	Not marked-up

Inflation

1.64%	Avg. annual inflation from 2010 to 2017
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Table B-5					
Alternative 2B - Building Demolition with Off-site Disposal (75% Hazardous)					
Item	Description	Quantity	Unit	Unit Price (Incl. O&P)	Total Cost
	Construction Subtotal				\$ 7,732,910
	Site Preparation				\$ 15,246
1	Temporary facilities	1.0	ls	\$ 15,246.00	\$ 15,246
	Asbestos Survey				\$ 8,990
2	Asbestos survey	1.0	ls	\$ 8,990.28	\$ 8,990
	Equipment Decontamination				\$ 84,386
3	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 71,948.09	\$ 71,948
4	Transportation and disposal (2,750 gallons of wastewater)	1.0	ls	\$ 12,438.15	\$ 12,438
	Asbestos Removal and Disposal				\$ 534,072
5	Asbestos removal - Production Building	1.0	ls	\$ 175,703.08	\$ 175,703
6	Asbestos removal - Building 1	1.0	ls	\$ 44,988.86	\$ 44,989
7	Asbestos removal - Building 2	1.0	ls	\$ 216,245.87	\$ 216,246
8	Asbestos removal - Building 3	1.0	ls	\$ 97,134.31	\$ 97,134
	PCB Removal and Disposal				\$ 754,624
9	PCB removal - Production Building	1.0	ls	\$ 216,363.38	\$ 216,363
10	PCB removal - Building 1	1.0	ls	\$ 20,856.37	\$ 20,856
11	PCB removal - Building 2	1.0	ls	\$ 84,477.92	\$ 84,478
12	PCB removal - Building 3	1.0	ls	\$ 137,953.45	\$ 137,953
13	PCB disposal	1,043.0	ton	\$ 282.81	\$ 294,974
	Metal Decontamination				\$ 99,668
14	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 87,229.76	\$ 87,230
15	Transportation and disposal (2,750 gallons of wastewater)	1.0	ls	\$ 12,438.15	\$ 12,438
	Building Demolition				\$ 732,764
16	Building demolition - Production Building	1.0	ls	\$ 521,226.47	\$ 521,226
17	Building demolition - Building 1	1.0	ls	\$ 14,968.25	\$ 14,968
18	Building demolition - Building 2	1.0	ls	\$ 142,045.63	\$ 142,046
19	Building demolition - Building 3	1.0	ls	\$ 53,087.26	\$ 53,087
20	Building demolition - Walkway	1.0	ls	\$ 1,436.95	\$ 1,437

Appendix B
Building Demolition
Des Moines TCE Site
Des Moines, Iowa

Table B-5					
Alternative 2B - Building Demolition with Off-site Disposal (75% Hazardous)					
Item	Description	Quantity	Unit	Unit Price (Incl. O&P)	Total Cost
	Slab Demolition				\$ 519,363
21	Slab demolition - Production Building	1.0	ls	\$ 249,575.67	\$ 249,576
22	Slab demolition - Building 1	1.0	ls	\$ 6,109.47	\$ 6,109
23	Slab demolition - Building 2	1.0	ls	\$ 57,971.81	\$ 57,972
24	Slab demolition - Building 3	1.0	ls	\$ 31,167.14	\$ 31,167
25	Slab demolition - Maintenance Building	1.0	ls	\$ 18,700.78	\$ 18,701
26	Slab demolition - Buildings 4 and 5	1.0	ls	\$ 155,838.21	\$ 155,838
	Waste Characterization				\$ 358,895
27	Sampling and analysis for pesticides, PCBs, VOCs, and dioxins (200 building debris samples [4 samples per 1,000 cy] and 100 wastewater samples)	1.0	ls	\$ 358,894.61	\$ 358,895
	Transportation and Disposal				\$ 3,464,906
28	Dump charges (non-hazardous waste)	24,221.0	ton	\$ 39.90	\$ 966,418
29	Load and haul (non-hazardous waste)	24,221.0	ton	\$ 22.37	\$ 541,703
30	Transportation and disposal (hazardous)	6,919.0	ton	\$ 282.81	\$ 1,956,785
	Capping				\$ 1,097,064
31	Seeding, vegetative cover	7.9	ac	\$ 5,158.60	\$ 40,805
32	Topsoil, 6 inches deep	7,971.3	lcy	\$ 52.69	\$ 419,982
33	Fill, 6 inches deep	7,971.3	cy	\$ 36.04	\$ 287,297
34	Clay, low permeability, 6 inches deep	8,927.9	cy	\$ 39.09	\$ 348,980
	Measurement				\$ 62,932
35	Pre-construction surveying	14.0	days	\$ 2,247.59	\$ 31,466
36	Post-construction surveying	14.0	days	\$ 2,247.59	\$ 31,466
Construction subtotal					\$ 7,732,910
Construction Contractor Mobe/Demobe, Site Prep and Submittals					\$ 773,291.00
Pre-design investigation					\$ 773,291.00
Engineering design					\$ 1,391,923.80
Project management and construction oversight					\$ 541,303.70
Recycling of metal (14,790 tons at \$90 per ton)					\$ (1,331,100.00)
Capital Cost Subtotal					\$ 9,881,620

Notes:

ac Acre
cy Cubic yard
lcy Linear cubic yard
ls Lump sum

Appendix B
Building Demolition
Des Moines TCE Site
Des Moines, Iowa

ALTERNATIVE 3
BUILDING DEMOLITION WITH ON-SITE CONTAINMENT (25-75% HAZARDOUS)

Table B-6				
Alternative 3 - Building Demolition with On-site Containment (25-75% Hazardous)				
Source	Description	Subtotal	Contingency	Total (Rounded)
Table B-7	Design and Construction	\$ 10,722,607	\$ 3,216,782	\$ 13,939,000
Contingency		30%	\$ 3,216,782	
Total				\$ 13,939,000

**Appendix B
Building Demolition
Des Moines TCE Site
Des Moines, Iowa**

Capital Cost

Location factor (for zip code 433xx)

ECHOS

Get-a-Quote

1
1.04

Note: Location factor applied only to national average unit costs; not applied to local unit costs such as from vendors or Means.

Overhead and Profit (O&P)

General

Means

RACER

Contractor quote

Professional judgment

25%
-
25%
5%
-

Typical general contractor overhead and profit

NA

NA

Prime contractor markup

Not marked-up

Inflation

1.64%

Avg. annual inflation from 2010 to 2017

Table B-7					
Alternative 3 - Building Demolition with On-site Containment (25-75% Hazardous)					
Item	Description	Quantity	Unit	Unit Price (Incl. O&P)	Total Cost
	Construction Subtotal				\$ 8,311,660
	Site Preparation				\$ 15,246
1	Temporary facilities	1.0	ls	\$ 15,246.00	\$ 15,246
	Asbestos Survey				\$ 8,990
2	Asbestos survey	1.0	ls	\$ 8,990.28	\$ 8,990
	Equipment Decontamination				\$ 83,920
3	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 71,948.09	\$ 71,948
4	Transportation and disposal (2,400 gallons of wastewater)	1.0	ls	\$ 11,971.98	\$ 11,972
	Asbestos Removal and Disposal				\$ 534,072
5	Asbestos removal - Production Building	1.0	ls	\$ 175,703.08	\$ 175,703
6	Asbestos removal - Building 1	1.0	ls	\$ 44,988.86	\$ 44,989
7	Asbestos removal - Building 2	1.0	ls	\$ 216,245.87	\$ 216,246
8	Asbestos removal - Building 3	1.0	ls	\$ 97,134.31	\$ 97,134
	PCB Removal and Disposal				\$ 747,032
9	PCB removal - Production Building	1.0	ls	\$ 209,437.50	\$ 209,438
10	PCB removal - Building 1	1.0	ls	\$ 20,188.75	\$ 20,189
11	PCB removal - Building 2	1.0	ls	\$ 84,477.92	\$ 84,478
12	PCB removal - Building 3	1.0	ls	\$ 137,953.45	\$ 137,953
13	PCB disposal	1,043.0	ton	\$ 282.81	\$ 294,974
	Metal Decontamination				\$ 99,202
14	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 87,229.76	\$ 87,230
15	Transportation and disposal (2,400 gallons of wastewater)	1.0	ls	\$ 11,971.98	\$ 11,972
	Building Demolition				\$ 732,764
16	Building demolition - Production Building	1.0	ls	\$ 521,226.47	\$ 521,226
17	Building demolition - Building 1	1.0	ls	\$ 14,968.25	\$ 14,968
18	Building demolition - Building 2	1.0	ls	\$ 142,045.63	\$ 142,046
19	Building demolition - Building 3	1.0	ls	\$ 53,087.26	\$ 53,087
20	Building demolition - Walkway	1.0	ls	\$ 1,436.95	\$ 1,437

Appendix B
Building Demolition
Des Moines TCE Site
Des Moines, Iowa

Table B-7					
Alternative 3 - Building Demolition with On-site Containment (25-75% Hazardous)					
Item	Description	Quantity	Unit	Unit Price (Incl. O&P)	Total Cost
	Waste Characterization				\$ 329,441
21	Sampling and analysis for pesticides, PCBs, VOCs, and dioxins (175 building debris samples [4 samples per 1,000 cy] and 100 wastewater samples)	1.0	ls	\$ 329,440.53	\$ 329,441
	Vegetative Cap				\$ 1,920,749
22	Seeding, vegetative cover	13.8	ac	\$ 5,158.60	\$ 71,395
23	Topsoil, 6 inches deep	13,956.7	lcy	\$ 52.69	\$ 735,327
24	Fill, 6 inches deep	13,956.7	cy	\$ 36.04	\$ 503,014
25	Clay, low permeability, 6 inches deep (includes 1.6-1.8 feet debris foundation layer)	15,631.4	cy	\$ 39.09	\$ 611,013
	Prescriptive Cap				\$ 3,244,187
26	Seeding, vegetative cover	4.1	ac	\$ 5,158.60	\$ 21,357
27	Topsoil, 12 inches deep	8,356.7	lcy	\$ 52.69	\$ 440,286
28	Fill, 6 inch lifts (includes delivery, spreading, and compaction)	25,070.2	cy	\$ 36.04	\$ 903,558
29	Clay, low permeability, 2 feet (includes 0.8-1.4 feet debris foundation layer)	18,719.1	cy	\$ 39.09	\$ 731,704
30	Drainage netting, geotextile fabric heat-bonded 2 sides	198,555.6	sf	\$ 0.88	\$ 174,353
31	60 Mil polymetric liner, high-density polyethylene	198,555.6	sf	\$ 0.96	\$ 189,737
32	Sodium bentonite flocculant aid	1,263,536.0	lb	\$ 0.62	\$ 783,192
	Crushing				\$ 533,125
33	Bulldozer (crushing debris for fill)	800.0	hr	\$ 276.24	\$ 220,994
34	Backhoe, 0.75 CY (crushing debris for fill)	800.0	hr	\$ 147.26	\$ 117,811
35	Jackhammer (crushing of debris for fill)	800.0	hr	\$ 242.90	\$ 194,320
	Measurement				\$ 62,932
36	Pre-construction surveying	14.0	days	\$ 2,247.59	\$ 31,466
37	Post-construction surveying	14.0	days	\$ 2,247.59	\$ 31,466
Construction subtotal					\$ 8,311,660
Construction Contractor Mobe/Demobe, Site Prep and Submittals					10% \$ 831,166.00
Pre-design investigation					10% \$ 831,166.00
Engineering design					18% \$ 1,496,098.80
Project management and construction oversight					7% \$ 581,816.20
Recycling of metal (14,770 tons at \$90 per ton)					\$ (1,329,300.00)
Capital Cost Subtotal					\$ 10,722,607

Notes:

ac	Acre
cy	Cubic yard
hr	Hour
lb	Pound
lcy	Loose cubic yard
ls	Lump sum
sf	Square foot
sy	Square yard

APPENDIX C

COST BREAKDOWN FOR PRODUCTION BUILDING

Appendix C
Production Building Cost Breakdown
Des Moines TCE Site
Des Moines, Iowa

TABLE C-1			
COST SUMMARY			
Alternative	Option	Description	Total
2	NA	Building Demolition with Off-site Disposal	\$ 5,901,000
3	NA	Building Demolition with On-site Containment	\$ 4,606,000

Appendix C
Production Building Cost Breakdown
Des Moines TCE Site
Des Moines, Iowa

ALTERNATIVE 2
BUILDING DEMOLITION WITH OFF-SITE DISPOSAL

Table C-2					
Alternative 2 - Building Demolition with Off-site Disposal					
Source	Description	Subtotal		Contingency	Total (Rounded)
Table C-3	Design and Construction	\$ 4,539,563		\$ 1,361,869	\$ 5,901,000
	Contingency	30%		\$ 1,361,869	
	Total			\$	5,901,000

Appendix C
Production Building Cost Breakdown
Des Moines TCE Site
Des Moines, Iowa

Capital Cost

Location factor (for zip code 433xx)

ECHOS	1
Get-a-Quote	1.04

Note: Location factor applied only to national average unit costs; not applied to local unit costs such as from vendors or Means.

Overhead and Profit (O&P)

General	25%	Typical general contractor overhead and profit
Means	-	NA
RACER	25%	NA
Contractor quote	5%	Prime contractor markup
Professional judgment	-	Not marked-up

Inflation

1.64%	Avg. annual inflation from 2010 to 2017
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Table C-3						
Alternative 2 - Building Demolition with Off-site Disposal						
Item	Description	Quantity	Unit	Unit Price	Unit Price (Incl. O&P)	Total Cost
	Construction Subtotal					\$ 3,729,947
	Site Preparation					\$ 15,246
1	Temporary facilities	1.0	ls	\$ 15,000.00	\$ 15,246.00	\$ 15,246
	Asbestos Survey					\$ 6,920
2	Asbestos survey (includes 65 samples)	1.0	ls	\$ 5,359.00	\$ 6,920.27	\$ 6,920
	Equipment Decontamination					\$ 81,118
3	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 55,716.00	\$ 71,948.09	\$ 71,948
4	Transportation and disposal (1,800 gallons of wastewater)	1.0	ls	\$ 7,101.00	\$ 9,169.78	\$ 9,170
	Asbestos Removal and Disposal					\$ 175,703
5	Asbestos removal - Production Building	1.0	ls	\$ 136,063.00	\$ 175,703.08	\$ 175,703
	PCB Removal and Disposal (Insulation)					\$ 380,112
6	PCB removal - Production Building	1.0	ls	\$ 167,550.00	\$ 216,363.38	\$ 216,363
7	PCB disposal	579.0	ton	\$ 265.00	\$ 282.81	\$ 163,749
	Metal Decontamination					\$ 96,400
8	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 67,550.00	\$ 87,229.76	\$ 87,230
9	Transportation and disposal (1,800 gallons of wastewater)	1.0	ls	\$ 7,101.00	\$ 9,169.78	\$ 9,170
	Building Demolition					\$ 521,226
10	Building demolition - Production Building	1.0	ls	\$ 403,633.44	\$ 521,226.47	\$ 521,226

Appendix C
Production Building Cost Breakdown
Des Moines TCE Site
Des Moines, Iowa

Table C-3						
Alternative 2 - Building Demolition with Off-site Disposal						
Item	Description	Quantity	Unit	Unit Price	Unit Price (Incl. O&P)	Total Cost
	Slab Demolition					\$ 249,576
11	Slab demolition - Production Building	1.0	ls	\$ 193,269.32	\$ 249,575.67	\$ 249,576
	Waste Characterization					\$ 252,863
12	Sampling and analysis for pesticides, PCBs, VOCs, and dioxins (140 building debris samples [4 samples per 1,000 cy] and 70 wastewater samples)	1.0	ls	\$ 195,815.00	\$ 252,863.00	\$ 252,863
	Transportation and Disposal					\$ 1,379,357
13	Dump charges (non-hazardous waste)	22,153.0	ton	\$ 38.00	\$ 39.90	\$ 883,905
14	Load and haul (non-hazardous waste)	22,153.0	ton	\$ 21.30	\$ 22.37	\$ 495,452
	Capping					\$ 530,970
15	Seeding, vegetative cover	3.8	ac	\$ 3,994.78	\$ 5,158.60	\$ 19,757
16	Topsoil, 6 inches deep	3,858.0	lcy	\$ 40.80	\$ 52.69	\$ 203,265
17	Fill, 6 inches deep	3,858.0	cy	\$ 27.91	\$ 36.04	\$ 139,047
18	Clay, low permeability, 6 inches deep	4,321.0	cy	\$ 30.27	\$ 39.09	\$ 168,901
	Measurement					\$ 40,456
19	Pre-construction surveying	9.0	days	\$ 1,620.00	\$ 2,247.59	\$ 20,228
20	Post-construction surveying	9.0	days	\$ 1,620.00	\$ 2,247.59	\$ 20,228
Construction subtotal						\$ 3,729,947
Construction Contractor Mobe/Demobe, Site Prep and Submittals						\$ 372,995
Pre-design investigation						\$ 372,995
Engineering design						\$ 671,390
Project management and construction oversight						\$ 261,096
Recycling of metal (9,654 tons at \$90 per ton)						\$ (868,860)
Capital Cost Subtotal						\$ 4,539,563

Notes:
ac Acre
cy Cubic yard
lcy Linear cubic yard
ls Lump sum

Appendix C
Production Building Cost Breakdown
Des Moines TCE Site
Des Moines, Iowa

ALTERNATIVE 3
BUILDING DEMOLITION WITH ON-SITE CONTAINMENT

Table C-4					
Alternative 3 - Building Demolition with On-site Containment					
Source	Description	Subtotal		Contingency	Total (Rounded)
Table C-5	Design and Construction	\$ 3,543,105		\$ 1,062,931	\$ 4,606,000
	Contingency		30%	\$ 1,062,931	
	Total				\$ 4,606,000

Appendix C
Production Building Cost Breakdown
Des Moines TCE Site
Des Moines, Iowa

Capital Cost

Location factor (for zip code 433xx)	
ECHOS	1
Get-a-Quote	1.04

Note: Location factor applied only to national average unit costs; not applied to local unit costs such as from vendors or Means.

Overhead and Profit (O&P)		
General	25%	Typical general contractor overhead and profit
Means	-	NA
RACER	25%	NA
Contractor quote	5%	Prime contractor markup
Professional judgment	-	Not marked-up
Inflation	1.64%	Avg. annual inflation from 2010 to 2017

Table C-5						
Alternative 3 - Building Demolition with On-site Containment						
Item	Description	Quantity	Unit	Unit Price	Unit Price (Incl. O&P)	Total Cost
	Construction Subtotal					\$ 3,360,279
	Site Preparation					\$ 15,246
1	Temporary facilities	1.0	ls	\$ 15,000.00	\$ 15,246.00	\$ 15,246
	Asbestos Survey					\$ 6,920
2	Asbestos survey (includes 65 samples)	1.0	ls	\$ 5,359.00	\$ 6,920.27	\$ 6,920
	Equipment Decontamination					\$ 81,118
3	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 55,716.00	\$ 71,948.09	\$ 71,948
4	Transportation and disposal (1,800 gallons of wastewater)	1.0	ls	\$ 7,101.00	\$ 9,169.78	\$ 9,170
	Asbestos Removal and Disposal					\$ 175,703
5	Asbestos removal - Production Building	1.0	ls	\$ 136,063.00	\$ 175,703.08	\$ 175,703
	PCB Removal and Disposal					\$ 380,112
6	PCB removal - Production Building	1.0	ls	\$ 167,550.00	\$ 216,363.38	\$ 216,363
7	PCB disposal	579.0	ton	\$ 265.00	\$ 282.81	\$ 163,749
	Metal Decontamination					\$ 96,400
8	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 67,550.00	\$ 87,229.76	\$ 87,230
9	Transportation and disposal (1,800 gallons of wastewater)	1.0	ls	\$ 7,101.00	\$ 9,169.78	\$ 9,170
	Building Demolition					\$ 521,226
10	Building demolition - Production Building	1.0	ls	\$ 403,633.44	\$ 521,226.47	\$ 521,226

Appendix C
Production Building Cost Breakdown
Des Moines TCE Site
Des Moines, Iowa

Table C-5						
Alternative 3 - Building Demolition with On-site Containment						
Item	Description	Quantity	Unit	Unit Price	Unit Price (Incl. O&P)	Total Cost
	Waste Characterization					\$ 241,082
11	Sampling and analysis for pesticides, PCBs, VOCs, and dioxins (130 building debris samples [4 samples per 1,000 cy] and 70 wastewater samples)	1.0	ls	\$ 186,692.00	\$ 241,082.14	\$ 241,082
	Vegetative Cap					\$ 1,446,495
12	Seeding, vegetative cover	10.4	ac	\$ 3,994.78	\$ 5,158.60	\$ 53,753
13	Topsoil, 6 inches deep	10,510.7	lcy	\$ 40.80	\$ 52.69	\$ 553,772
14	Fill, 6 inches deep	10,510.7	cy	\$ 27.91	\$ 36.04	\$ 378,818
15	Clay, low permeability, 6 inches deep (includes 1.6-1.8 feet debris foundation layer)	11,772.0	cy	\$ 30.27	\$ 39.09	\$ 460,152
	Crushing					\$ 346,531
15	Bulldozer (crushing debris for fill)	520.0	hr	\$ 213.92	\$ 276.24	\$ 143,646
16	Backhoe, 0.75 CY (crushing debris for fill)	520.0	hr	\$ 114.04	\$ 147.26	\$ 76,577
17	Jackhammer (crushing of debris for fill)	520.0	hr	\$ 188.10	\$ 242.90	\$ 126,308
	Measurement					\$ 49,446
18	Pre-construction surveying	11.0	days	\$ 1,620.00	\$ 2,247.59	\$ 24,723
19	Post-construction surveying	11.0	days	\$ 1,620.00	\$ 2,247.59	\$ 24,723
Construction subtotal						\$ 3,360,279
Construction Contractor Mobe/Demobe, Site Prep and Submittals						\$ 336,027.90
Pre-design investigation						\$ 336,027.90
Engineering design						\$ 604,850.22
Project management and construction oversight						\$ 235,219.53
Recycling of metal (14,770 tons at \$90 per ton)						\$ (1,329,300.00)
Capital Cost Subtotal						\$ 3,543,105

Notes:

ea Each
hr Hour
ls Lump sum
sy Square yard

APPENDIX D
COST SAVINGS ANALYSIS

ALTERNATIVE 2

BUILDING DEMOLITION WITH OFF-SITE DISPOSAL

Appendix D
Cost Savings - No Cap
Des Moines TCE Site
Des Moines, Iowa

TABLE D-1			
COST SUMMARY			
Alternative	Option	Description	Total
2A	NA	Building Demolition with Off-site Disposal (25% Hazardous)	\$ 9,222,000
2B	NA	Building Demolition with Off-site Disposal (75% Hazardous)	\$ 10,941,000

Appendix D
Cost Savings - No Cap
Des Moines TCE Site
Des Moines, Iowa

ALTERNATIVE 2A
BUILDING DEMOLITION WITH OFF-SITE DISPOSAL (25% HAZARDOUS)

Table D-2				
Alternative 2A - Building Demolition with Off-site Disposal (25% Hazardous)				
Source	Description	Subtotal	Contingency	Total (Rounded)
Table D-3	Design and Construction	\$ 7,093,926	\$ 2,128,178	\$ 9,222,000
	Contingency	30%	\$ 2,128,178	
Total			\$	9,222,000

Appendix D
Cost Savings - No Cap
Des Moines TCE Site
Des Moines, Iowa

Capital Cost

Location factor (for zip code 433xx)

ECHOS	1
Get-a-Quote	1.04

Note: Location factor applied only to national average unit costs; not applied to local unit costs such as from vendors or Means.

Overhead and Profit (O&P)

General	25%	Typical general contractor overhead and profit
Means	-	NA
RACER	25%	NA
Contractor quote	5%	Prime contractor markup
Professional judgment	-	Not marked-up

Inflation 1.64% Avg. annual inflation from 2010 to 2017

Table D-3					
Alternative 2A - Building Demolition with Off-site Disposal (25% Hazardous)					
Item	Description	Quantity	Unit	Unit Price (Incl. O&P)	Total Cost
	Construction Subtotal				\$ 5,810,363
	Site Preparation				\$ 15,246
1	Temporary facilities	1.0	ls	\$ 15,246.00	\$ 15,246
	Asbestos Survey				\$ 8,990
2	Asbestos survey	1.0	ls	\$ 8,990.28	\$ 8,990
	Equipment Decontamination				\$ 84,386
3	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 71,948.09	\$ 71,948
4	Transportation and disposal (2,750 gallons of wastewater)	1.0	ls	\$ 12,438.15	\$ 12,438
	Asbestos Removal and Disposal				\$ 534,072
5	Asbestos removal - Production Building	1.0	ls	\$ 175,703.08	\$ 175,703
6	Asbestos removal - Building 1	1.0	ls	\$ 44,988.86	\$ 44,989
7	Asbestos removal - Building 2	1.0	ls	\$ 216,245.87	\$ 216,246
8	Asbestos removal - Building 3	1.0	ls	\$ 97,134.31	\$ 97,134
	PCB Removal and Disposal (Insulation)				\$ 754,624
9	PCB removal - Production Building	1.0	ls	\$ 216,363.38	\$ 216,363
10	PCB removal - Building 1	1.0	ls	\$ 20,856.37	\$ 20,856
11	PCB removal - Building 2	1.0	ls	\$ 84,477.92	\$ 84,478
12	PCB removal - Building 3	1.0	ls	\$ 137,953.45	\$ 137,953
13	PCB disposal	1,043.0	ton	\$ 282.81	\$ 294,974
	Metal Decontamination				\$ 99,668
14	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 87,229.76	\$ 87,230
15	Transportation and disposal (2,750 gallons of wastewater)	1.0	ls	\$ 12,438.15	\$ 12,438
	Building Demolition				\$ 732,764
16	Building demolition - Production Building	1.0	ls	\$ 521,226.47	\$ 521,226
17	Building demolition - Building 1	1.0	ls	\$ 14,968.25	\$ 14,968
18	Building demolition - Building 2	1.0	ls	\$ 142,045.63	\$ 142,046
19	Building demolition - Building 3	1.0	ls	\$ 53,087.26	\$ 53,087
20	Building demolition - Walkway	1.0	ls	\$ 1,436.95	\$ 1,437

Appendix D
Cost Savings - No Cap
Des Moines TCE Site
Des Moines, Iowa

Table D-3					
Alternative 2A - Building Demolition with Off-site Disposal (25% Hazardous)					
Item	Description	Quantity	Unit	Unit Price (Incl. O&P)	Total Cost
	Slab Demolition				\$ 519,363
21	Slab demolition - Production Building	1.0	ls	\$ 249,575.67	\$ 249,576
22	Slab demolition - Building 1	1.0	ls	\$ 6,109.47	\$ 6,109
23	Slab demolition - Building 2	1.0	ls	\$ 57,971.81	\$ 57,972
24	Slab demolition - Building 3	1.0	ls	\$ 31,167.14	\$ 31,167
25	Slab demolition - Maintenance Building	1.0	ls	\$ 18,700.78	\$ 18,701
26	Slab demolition - Buildings 4 and 5	1.0	ls	\$ 155,838.21	\$ 155,838
	Waste Characterization				\$ 358,895
27	Sampling and analysis for pesticides, PCBs, VOCs, and dioxins (200 building debris samples [4 samples per 1,000 cy] and 100 wastewater samples)	1.0	ls	\$ 358,894.61	\$ 358,895
	Transportation and Disposal				\$ 2,552,938
28	Dump charges (non-hazardous waste)	28,356.0	ton	\$ 39.90	\$ 1,131,404
29	Load and haul (non-hazardous waste)	28,356.0	ton	\$ 22.37	\$ 634,182
30	Transportation and disposal (hazardous)	2,784.0	ton	\$ 282.81	\$ 787,352
	Soil Confirmation Sampling				\$ 86,485
31	Laboratory analytical for 37 samples (5 samples per building location plus 2 QC, analysis for VOCs, PCBs, pesticides, herbicides, and dioxins)	37.0	ea	\$ 1,320.42	\$ 48,855
32	Sampling subcontractor (3.5 days, 10 samples per day)	3.5	days	\$ 4,506.83	\$ 15,774
33	Reporting	1.0	ls	\$ 21,855.87	\$ 21,856
	Measurement				\$ 62,932
34	Pre-construction surveying	14.0	days	\$ 2,247.59	\$ 31,466
35	Post-construction surveying	14.0	days	\$ 2,247.59	\$ 31,466
Construction subtotal				\$	5,810,363
Construction Contractor Mobe/Demobe, Site Prep and Submittals				10%	\$ 581,036
Pre-design investigation				10%	\$ 581,036
Engineering design				18%	\$ 1,045,865
Project management and construction oversight				7%	\$ 406,725
Recycling of metal (14,790 tons at \$90 per ton)					\$ (1,331,100)
Capital Cost Subtotal				\$	7,093,926

Notes:
ea Each
hr Hour
ls Lump sum

Appendix D
Cost Savings - No Cap
Des Moines TCE Site
Des Moines, Iowa

ALTERNATIVE 2B
BUILDING DEMOLITION WITH OFF-SITE DISPOSAL (75% HAZARDOUS)

Table D-4				
Alternative 2B - Building Demolition with Off-site Disposal (75% Hazardous)				
Source	Description	Subtotal	Contingency	Total (Rounded)
Table D-5	Design and Construction	\$ 8,416,280	\$ 2,524,884	\$ 10,941,000
Contingency		30%	\$ 2,524,884	
Total				\$ 10,941,000

Appendix D
Cost Savings - No Cap
Des Moines TCE Site
Des Moines, Iowa

Capital Cost

Location factor (for zip code 433xx)

ECHOS	1
Get-a-Quote	1.04

Note: Location factor applied only to national average unit costs; not applied to local unit costs such as from vendors or Means.

Overhead and Profit (O&P)

General	25%	Typical general contractor overhead and profit
Means	-	NA
RACER	25%	NA
Contractor quote	5%	Prime contractor markup
Professional judgment	-	Not marked-up

Inflation 1.64% Avg. annual inflation from 2010 to 2017

Table D-5					
Alternative 2B - Building Demolition with Off-site Disposal (75% Hazardous)					
Item	Description	Quantity	Unit	Unit Price (Incl. O&P)	Total Cost
	Construction Subtotal				\$ 6,722,331
	Site Preparation				\$ 15,246
1	Temporary facilities	1.0	ls	\$ 15,246.00	\$ 15,246
	Asbestos Survey				\$ 8,990
2	Asbestos survey	1.0	ls	\$ 8,990.28	\$ 8,990
	Equipment Decontamination				\$ 84,386
3	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 71,948.09	\$ 71,948
4	Transportation and disposal (2,750 gallons of wastewater)	1.0	ls	\$ 12,438.15	\$ 12,438
	Asbestos Removal and Disposal				\$ 534,072
5	Asbestos removal - Production Building	1.0	ls	\$ 175,703.08	\$ 175,703
6	Asbestos removal - Building 1	1.0	ls	\$ 44,988.86	\$ 44,989
7	Asbestos removal - Building 2	1.0	ls	\$ 216,245.87	\$ 216,246
8	Asbestos removal - Building 3	1.0	ls	\$ 97,134.31	\$ 97,134
	PCB Removal and Disposal				\$ 754,624
9	PCB removal - Production Building	1.0	ls	\$ 216,363.38	\$ 216,363
10	PCB removal - Building 1	1.0	ls	\$ 20,856.37	\$ 20,856
11	PCB removal - Building 2	1.0	ls	\$ 84,477.92	\$ 84,478
12	PCB removal - Building 3	1.0	ls	\$ 137,953.45	\$ 137,953
13	PCB disposal	1,043.0	ton	\$ 282.81	\$ 294,974
	Metal Decontamination				\$ 99,668
14	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 87,229.76	\$ 87,230
15	Transportation and disposal (2,750 gallons of wastewater)	1.0	ls	\$ 12,438.15	\$ 12,438
	Building Demolition				\$ 732,764
16	Building demolition - Production Building	1.0	ls	\$ 521,226.47	\$ 521,226
17	Building demolition - Building 1	1.0	ls	\$ 14,968.25	\$ 14,968
18	Building demolition - Building 2	1.0	ls	\$ 142,045.63	\$ 142,046
19	Building demolition - Building 3	1.0	ls	\$ 53,087.26	\$ 53,087
20	Building demolition - Walkway	1.0	ls	\$ 1,436.95	\$ 1,437

Appendix D
Cost Savings - No Cap
Des Moines TCE Site
Des Moines, Iowa

Table D-5					
Alternative 2B - Building Demolition with Off-site Disposal (75% Hazardous)					
Item	Description	Quantity	Unit	Unit Price (Incl. O&P)	Total Cost
	Slab Demolition				\$ 519,363
21	Slab demolition - Production Building	1.0	ls	\$ 249,575.67	\$ 249,576
22	Slab demolition - Building 1	1.0	ls	\$ 6,109.47	\$ 6,109
23	Slab demolition - Building 2	1.0	ls	\$ 57,971.81	\$ 57,972
24	Slab demolition - Building 3	1.0	ls	\$ 31,167.14	\$ 31,167
25	Slab demolition - Maintenance Building	1.0	ls	\$ 18,700.78	\$ 18,701
26	Slab demolition - Buildings 4 and 5	1.0	ls	\$ 155,838.21	\$ 155,838
	Waste Characterization				\$ 358,895
27	Sampling and analysis for pesticides, PCBs, VOCs, and dioxins (200 building debris samples [4 samples per 1,000 cy] and 100 wastewater samples)	1.0	ls	\$ 358,894.61	\$ 358,895
	Transportation and Disposal				\$ 3,464,906
28	Dump charges (non-hazardous waste)	24,221.0	ton	\$ 39.90	\$ 966,418
29	Load and haul (non-hazardous waste)	24,221.0	ton	\$ 22.37	\$ 541,703
30	Transportation and disposal (hazardous)	6,919.0	ton	\$ 282.81	\$ 1,956,785
	Soil Confirmation Sampling				\$ 86,485
31	Laboratory analytical for 37 samples (5 samples per building location plus 2 QC, analysis for	37.0	ea	\$ 1,320.42	\$ 48,855
32	Sampling subcontractor (3.5 days, 10 samples per day)	3.5	days	\$ 4,506.83	\$ 15,774
33	Reporting	1.0	ls	\$ 21,855.87	\$ 21,856
	Measurement				\$ 62,932
34	Pre-construction surveying	14.0	days	\$ 2,247.59	\$ 31,466
35	Post-construction surveying	14.0	days	\$ 2,247.59	\$ 31,466
Construction subtotal					\$ 6,722,331
Construction Contractor Mobe/Demobe, Site Prep and Submittals					\$ 672,233
Pre-design investigation					\$ 672,233
Engineering design					\$ 1,210,020
Project management and construction oversight					\$ 470,563
Recycling of metal (14,790 tons at \$90 per ton)					\$ (1,331,100)
Capital Cost Subtotal					\$ 8,416,280

Notes:

- ea Each
- hr Hour
- ls Lump sum

Appendix D
Cost Savings - Leave Slab Foundations in Place
Des Moines TCE Site
Des Moines, Iowa

TABLE D-1			
COST SUMMARY			
Alternative	Option	Description	Total
2A	NA	Building Demolition with Off-site Disposal (25% Hazardous)	\$ 7,798,000
2B	NA	Building Demolition with Off-site Disposal (75% Hazardous)	\$ 8,815,000

Appendix D
Cost Savings - Leave Slab Foundations in Place
Des Moines TCE Site
Des Moines, Iowa

ALTERNATIVE 2A
BUILDING DEMOLITION WITH OFF-SITE DISPOSAL (25% HAZARDOUS)

Table D-2				
Alternative 2A - Building Demolition with Off-site Disposal (25% Hazardous)				
Source	Description	Subtotal	Contingency	Total (Rounded)
Table D-3	Design and Construction	\$ 5,998,497	\$ 1,799,549	\$ 7,798,000
Contingency		30%	\$ 1,799,549	
Total			\$	7,798,000

Appendix D
Cost Savings - Leave Slab Foundations in Place
Des Moines TCE Site
Des Moines, Iowa

Capital Cost

Location factor (for zip code 433xx)

ECHOS	1
Get-a-Quote	1.04

Note: Location factor applied only to national average unit costs; not applied to local unit costs such as from vendors or Means.

Overhead and Profit (O&P)

General	25%	Typical general contractor overhead and profit
Means	-	NA
RACER	25%	NA
Contractor quote	5%	Prime contractor markup
Professional judgment	-	Not marked-up

Inflation 1.64% Avg. annual inflation from 2010 to 2017

Table D-3					
Alternative 2A - Building Demolition with Off-site Disposal (25% Hazardous)					
Item	Description	Quantity	Unit	Unit Price (Incl. O&P)	Total Cost
	Construction Subtotal				\$ 5,053,653
	Site Preparation				\$ 15,246
1	Temporary facilities	1.0	ls	\$ 15,246.00	\$ 15,246
	Asbestos Survey				\$ 8,990
2	Asbestos survey	1.0	ls	\$ 8,990.28	\$ 8,990
	Equipment Decontamination				\$ 83,920
3	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 71,948.09	\$ 71,948
4	Transportation and disposal (2,400 gallons of wastewater)	1.0	ls	\$ 11,971.98	\$ 11,972
	Asbestos Removal and Disposal				\$ 534,072
5	Asbestos removal - Production Building	1.0	ls	\$ 175,703.08	\$ 175,703
6	Asbestos removal - Building 1	1.0	ls	\$ 44,988.86	\$ 44,989
7	Asbestos removal - Building 2	1.0	ls	\$ 216,245.87	\$ 216,246
8	Asbestos removal - Building 3	1.0	ls	\$ 97,134.31	\$ 97,134
	PCB Removal and Disposal (Insulation)				\$ 754,624
9	PCB removal - Production Building	1.0	ls	\$ 216,363.38	\$ 216,363
10	PCB removal - Building 1	1.0	ls	\$ 20,856.37	\$ 20,856
11	PCB removal - Building 2	1.0	ls	\$ 84,477.92	\$ 84,478
12	PCB removal - Building 3	1.0	ls	\$ 137,953.45	\$ 137,953
13	PCB disposal	1,043.0	ton	\$ 282.81	\$ 294,974
	Metal Decontamination				\$ 99,202
14	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 87,229.76	\$ 87,230
15	Transportation and disposal (2,400 gallons of wastewater)	1.0	ls	\$ 11,971.98	\$ 11,972
	Building Demolition				\$ 732,764
16	Building demolition - Production Building	1.0	ls	\$ 521,226.47	\$ 521,226
17	Building demolition - Building 1	1.0	ls	\$ 14,968.25	\$ 14,968
18	Building demolition - Building 2	1.0	ls	\$ 142,045.63	\$ 142,046
19	Building demolition - Building 3	1.0	ls	\$ 53,087.26	\$ 53,087
20	Building demolition - Walkway	1.0	ls	\$ 1,436.95	\$ 1,437

Appendix D
Cost Savings - Leave Slab Foundations in Place
Des Moines TCE Site
Des Moines, Iowa

Table D-3					
Alternative 2A - Building Demolition with Off-site Disposal (25% Hazardous)					
Item	Description	Quantity	Unit	Unit Price (Incl. O&P)	Total Cost
	Waste Characterization				\$ 329,441
21	Sampling and analysis for pesticides, PCBs, VOCs, and dioxins (175 building debris samples [4 samples per 1,000 cy] and 100 wastewater samples)	1.0	ls	\$ 329,440.53	\$ 329,441
	Transportation and Disposal				\$ 2,432,462
22	Dump charges (non-hazardous waste)	23,982.0	ton	\$ 39.90	\$ 956,882
23	Load and haul (non-hazardous waste)	23,982.0	ton	\$ 22.37	\$ 536,357
24	Transportation and disposal (hazardous)	3,321.0	ton	\$ 282.81	\$ 939,223
	Measurement				\$ 62,932
25	Pre-construction surveying	14.0	days	\$ 2,247.59	\$ 31,466
26	Post-construction surveying	14.0	days	\$ 2,247.59	\$ 31,466
Construction subtotal				\$	5,053,653
Construction Contractor Mobe/Demobe, Site Prep and Submittals				10%	\$ 505,365
Pre-design investigation				10%	\$ 505,365
Engineering design				18%	\$ 909,658
Project management and construction oversight				7%	\$ 353,756
Recycling of metal (14,770 tons at \$90 per ton)					\$ (1,329,300)
Capital Cost Subtotal				\$	5,998,497

Notes:
ls Lump sum

Appendix D
Cost Savings - Leave Slab Foundations in Place
Des Moines TCE Site
Des Moines, Iowa

ALTERNATIVE 2B
BUILDING DEMOLITION WITH OFF-SITE DISPOSAL (75% HAZARDOUS)

Table D-4				
Alternative 2B - Building Demolition with Off-site Disposal (75% Hazardous)				
Source	Description	Subtotal	Contingency	Total (Rounded)
Table D-5	Design and Construction	\$ 6,781,036	\$ 2,034,311	\$ 8,815,000
	Contingency	30%	\$ 2,034,311	
Total			\$	8,815,000

Appendix D
Cost Savings - Leave Slab Foundations in Place
Des Moines TCE Site
Des Moines, Iowa

Capital Cost

Location factor (for zip code 433xx)

ECHOS	1
Get-a-Quote	1.04

Note: Location factor applied only to national average unit costs; not applied to local unit costs such as from vendors or Means.

Overhead and Profit (O&P)

General	25%	Typical general contractor overhead and profit
Means	-	NA
RACER	25%	NA
Contractor quote	5%	Prime contractor markup
Professional judgment	-	Not marked-up

Inflation

1.64%	Avg. annual inflation from 2010 to 2017
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Table D-5					
Alternative 2B - Building Demolition with Off-site Disposal (75% Hazardous)					
Item	Description	Quantity	Unit	Unit Price (Incl. O&P)	Total Cost
	Construction Subtotal				\$ 5,593,335
	Site Preparation				\$ 15,246
1	Temporary facilities	1.0	ls	\$ 15,246.00	\$ 15,246
	Asbestos Survey				\$ 8,990
2	Asbestos survey	1.0	ls	\$ 8,990.28	\$ 8,990
	Equipment Decontamination				\$ 83,920
3	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 71,948.09	\$ 71,948
4	Transportation and disposal (2,400 gallons of wastewater)	1.0	ls	\$ 11,971.98	\$ 11,972
	Asbestos Removal and Disposal				\$ 534,072
5	Asbestos removal - Production Building	1.0	ls	\$ 175,703.08	\$ 175,703
6	Asbestos removal - Building 1	1.0	ls	\$ 44,988.86	\$ 44,989
7	Asbestos removal - Building 2	1.0	ls	\$ 216,245.87	\$ 216,246
8	Asbestos removal - Building 3	1.0	ls	\$ 97,134.31	\$ 97,134
	PCB Removal and Disposal				\$ 754,624
9	PCB removal - Production Building	1.0	ls	\$ 216,363.38	\$ 216,363
10	PCB removal - Building 1	1.0	ls	\$ 20,856.37	\$ 20,856
11	PCB removal - Building 2	1.0	ls	\$ 84,477.92	\$ 84,478
12	PCB removal - Building 3	1.0	ls	\$ 137,953.45	\$ 137,953
13	PCB disposal	1,043.0	ton	\$ 282.81	\$ 294,974
	Metal Decontamination				\$ 99,202
14	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 87,229.76	\$ 87,230
15	Transportation and disposal (2,400 gallons of wastewater)	1.0	ls	\$ 11,971.98	\$ 11,972
	Building Demolition				\$ 732,764
16	Building demolition - Production Building	1.0	ls	\$ 521,226.47	\$ 521,226
17	Building demolition - Building 1	1.0	ls	\$ 14,968.25	\$ 14,968
18	Building demolition - Building 2	1.0	ls	\$ 142,045.63	\$ 142,046
19	Building demolition - Building 3	1.0	ls	\$ 53,087.26	\$ 53,087
20	Building demolition - Walkway	1.0	ls	\$ 1,436.95	\$ 1,437

Appendix D
Cost Savings - Leave Slab Foundations in Place
Des Moines TCE Site
Des Moines, Iowa

Table D-5					
Alternative 2B - Building Demolition with Off-site Disposal (75% Hazardous)					
Item	Description	Quantity	Unit	Unit Price (Incl. O&P)	Total Cost
	Waste Characterization				\$ 329,441
21	Sampling and analysis for pesticides, PCBs, VOCs, and dioxins (175 building debris samples [4 samples per 1,000 cy] and 100 wastewater samples)	1.0	ls	\$ 329,440.53	\$ 329,441
	Transportation and Disposal				\$ 2,972,144
22	Dump charges (non-hazardous waste)	21,535.0	ton	\$ 39.90	\$ 859,247
23	Load and haul (non-hazardous waste)	21,535.0	ton	\$ 22.37	\$ 481,630
24	Transportation and disposal (hazardous)	5,768.0	ton	\$ 282.81	\$ 1,631,267
	Measurement				\$ 62,932
25	Pre-construction surveying	14.0	days	\$ 2,247.59	\$ 31,466
26	Post-construction surveying	14.0	days	\$ 2,247.59	\$ 31,466
Construction subtotal					\$ 5,593,335
Construction Contractor Mobe/Demobe, Site Prep and Submittals					\$ 559,334
Pre-design investigation					\$ 559,334
Engineering design					\$ 1,006,800
Project management and construction oversight					\$ 391,533
Recycling of metal (14,770 tons at \$90 per ton)					\$ (1,329,300)
Capital Cost Subtotal					\$ 6,781,036

Notes:

ls Lump sum

Appendix D
Cost Savings - Leave Slab Foundations in Place for Structures Previously Removed
Des Moines TCE Site
Des Moines, Iowa

TABLE D-1			
COST SUMMARY			
Alternative	Option	Description	Total
2A	NA	Building Demolition with Off-site Disposal (25% Hazardous)	\$ 8,699,000
2B	NA	Building Demolition with Off-site Disposal (75% Hazardous)	\$ 10,287,000

Appendix D
Cost Savings - Leave Slab Foundations in Place for Structures Previously Removed
Des Moines TCE Site
Des Moines, Iowa

ALTERNATIVE 2A
BUILDING DEMOLITION WITH OFF-SITE DISPOSAL (25% HAZARDOUS)

Table D-2				
Alternative 2A - Building Demolition with Off-site Disposal (25% Hazardous)				
Source	Description	Subtotal	Contingency	Total (Rounded)
Table D-3	Design and Construction	\$ 6,691,507	\$ 2,007,452	\$ 8,699,000
Contingency		30%	\$ 2,007,452	
Total			\$	8,699,000

Appendix D
Cost Savings - Leave Slab Foundations in Place for Structures Previously Removed
Des Moines TCE Site
Des Moines, Iowa

Capital Cost

Location factor (for zip code 433xx)

ECHOS	1
Get-a-Quote	1.04

Note: Location factor applied only to national average unit costs; not applied to local unit costs such as from vendors or Means.

Overhead and Profit (O&P)

General	25%	Typical general contractor overhead and profit
Means	-	NA
RACER	25%	NA
Contractor quote	5%	Prime contractor markup
Professional judgment	-	Not marked-up

Inflation 1.64% Avg. annual inflation from 2010 to 2017

Table D-3					
Alternative 2A - Building Demolition with Off-site Disposal (25% Hazardous)					
Item	Description	Quantity	Unit	Unit Price (Incl. O&P)	Total Cost
	Construction Subtotal				\$ 5,532,212
	Site Preparation				\$ 15,246
1	Temporary facilities	1.0	ls	\$ 15,246.00	\$ 15,246
	Asbestos Survey				\$ 8,990
2	Asbestos survey	1.0	ls	\$ 8,990.28	\$ 8,990
	Equipment Decontamination				\$ 84,386
3	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 71,948.09	\$ 71,948
4	Transportation and disposal (2,750 gallons of wastewater)	1.0	ls	\$ 12,438.15	\$ 12,438
	Asbestos Removal and Disposal				\$ 534,072
5	Asbestos removal - Production Building	1.0	ls	\$ 175,703.08	\$ 175,703
6	Asbestos removal - Building 1	1.0	ls	\$ 44,988.86	\$ 44,989
7	Asbestos removal - Building 2	1.0	ls	\$ 216,245.87	\$ 216,246
8	Asbestos removal - Building 3	1.0	ls	\$ 97,134.31	\$ 97,134
	PCB Removal and Disposal (Insulation)				\$ 754,624
9	PCB removal - Production Building	1.0	ls	\$ 216,363.38	\$ 216,363
10	PCB removal - Building 1	1.0	ls	\$ 20,856.37	\$ 20,856
11	PCB removal - Building 2	1.0	ls	\$ 84,477.92	\$ 84,478
12	PCB removal - Building 3	1.0	ls	\$ 137,953.45	\$ 137,953
13	PCB disposal	1,043.0	ton	\$ 282.81	\$ 294,974
	Metal Decontamination				\$ 99,668
14	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 87,229.76	\$ 87,230
15	Transportation and disposal (2,750 gallons of wastewater)	1.0	ls	\$ 12,438.15	\$ 12,438
	Building Demolition				\$ 732,764
16	Building demolition - Production Building	1.0	ls	\$ 521,226.47	\$ 521,226
17	Building demolition - Building 1	1.0	ls	\$ 14,968.25	\$ 14,968
18	Building demolition - Building 2	1.0	ls	\$ 142,045.63	\$ 142,046
19	Building demolition - Building 3	1.0	ls	\$ 53,087.26	\$ 53,087
20	Building demolition - Walkway	1.0	ls	\$ 1,436.95	\$ 1,437

Appendix D
Cost Savings - Leave Slab Foundations in Place for Structures Previously Removed
Des Moines TCE Site
Des Moines, Iowa

Table D-3					
Alternative 2A - Building Demolition with Off-site Disposal (25% Hazardous)					
Item	Description	Quantity	Unit	Unit Price (Incl. O&P)	Total Cost
	Slab Demolition				\$ 217,855
21	Slab demolition - Production Building (partial)	1.0	ls	\$ 130,086.63	\$ 130,087
22	Slab demolition - Building 1	1.0	ls	\$ 6,109.47	\$ 6,109
23	Slab demolition - Building 2	1.0	ls	\$ 57,971.81	\$ 57,972
24	Slab demolition - Building 3 (partial)	1.0	ls	\$ 23,686.98	\$ 23,687
	Waste Characterization				\$ 341,223
25	Sampling and analysis for pesticides, PCBs, VOCs, and dioxins (185 building debris samples [4 samples per 1,000 cy] and 100 wastewater samples)	1.0	ls	\$ 341,222.68	\$ 341,223
	Transportation and Disposal				\$ 2,221,390
26	Dump charges (non-hazardous waste)	27,001.0	ton	\$ 39.90	\$ 1,077,340
27	Load and haul (non-hazardous waste)	27,001.0	ton	\$ 22.37	\$ 603,877
28	Transportation and disposal (hazardous)	1,910.0	ton	\$ 282.81	\$ 540,173
	Capping				\$ 459,062
29	Seeding, vegetative cover	3.3	ac	\$ 5,158.60	\$ 17,075
30	Topsoil, 6 inches deep	3,335.6	lcy	\$ 52.69	\$ 175,740
31	Fill, 6 inches deep	3,335.6	cy	\$ 36.04	\$ 120,218
32	Clay, low permeability, 6 inches deep	3,735.8	cy	\$ 39.09	\$ 146,029
	Measurement				\$ 62,932
33	Pre-construction surveying	14.0	days	\$ 2,247.59	\$ 31,466
34	Post-construction surveying	14.0	days	\$ 2,247.59	\$ 31,466
Construction subtotal				\$	5,532,212
Construction Contractor Mobe/Demobe, Site Prep and Submittals				10%	\$ 553,221
Pre-design investigation				10%	\$ 553,221
Engineering design				18%	\$ 995,798
Project management and construction oversight				7%	\$ 387,255
Recycling of metal (14,780 tons at \$90 per ton)					\$ (1,330,200)
Capital Cost Subtotal				\$	6,691,507

Notes:

ac Acre
cy Cubic yard
lcy Linear cubic yard
ls Lump sum

Appendix D
Cost Savings - Leave Slab Foundations in Place for Structures Previously Removed
Des Moines TCE Site
Des Moines, Iowa

ALTERNATIVE 2B
BUILDING DEMOLITION WITH OFF-SITE DISPOSAL (75% HAZARDOUS)

Table D-4				
Alternative 2B - Building Demolition with Off-site Disposal (75% Hazardous)				
Source	Description	Subtotal	Contingency	Total (Rounded)
Table D-5	Design and Construction	\$ 7,912,715	\$ 2,373,814	\$ 10,287,000
Contingency		30%	\$ 2,373,814	
Total			\$ 10,287,000	

Appendix D
Cost Savings - Leave Slab Foundations in Place for Structures Previously Removed
Des Moines TCE Site
Des Moines, Iowa

Capital Cost

Location factor (for zip code 433xx)

ECHOS	1
Get-a-Quote	1.04

Note: Location factor applied only to national average unit costs; not applied to local unit costs such as from vendors or Means.

Overhead and Profit (O&P)

General	25%	Typical general contractor overhead and profit
Means	-	NA
RACER	25%	NA
Contractor quote	5%	Prime contractor markup
Professional judgment	-	Not marked-up

Inflation

1.64%	Avg. annual inflation from 2010 to 2017
-------	---

Table D-5					
Alternative 2B - Building Demolition with Off-site Disposal (75% Hazardous)					
Item	Description	Quantity	Unit	Unit Price (Incl. O&P)	Total Cost
	Construction Subtotal				\$ 6,374,424
	Site Preparation				\$ 15,246
1	Temporary facilities	1.0	ls	\$ 15,246.00	\$ 15,246
	Asbestos Survey				\$ 8,990
2	Asbestos survey	1.0	ls	\$ 8,990.28	\$ 8,990
	Equipment Decontamination				\$ 84,386
3	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 71,948.09	\$ 71,948
4	Transportation and disposal (2,750 gallons of wastewater)	1.0	ls	\$ 12,438.15	\$ 12,438
	Asbestos Removal and Disposal				\$ 534,072
5	Asbestos removal - Production Building	1.0	ls	\$ 175,703.08	\$ 175,703
6	Asbestos removal - Building 1	1.0	ls	\$ 44,988.86	\$ 44,989
7	Asbestos removal - Building 2	1.0	ls	\$ 216,245.87	\$ 216,246
8	Asbestos removal - Building 3	1.0	ls	\$ 97,134.31	\$ 97,134
	PCB Removal and Disposal				\$ 754,624
9	PCB removal - Production Building	1.0	ls	\$ 216,363.38	\$ 216,363
10	PCB removal - Building 1	1.0	ls	\$ 20,856.37	\$ 20,856
11	PCB removal - Building 2	1.0	ls	\$ 84,477.92	\$ 84,478
12	PCB removal - Building 3	1.0	ls	\$ 137,953.45	\$ 137,953
13	PCB disposal	1,043.0	ton	\$ 282.81	\$ 294,974
	Metal Decontamination				\$ 99,668
14	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 87,229.76	\$ 87,230
15	Transportation and disposal (2,750 gallons of wastewater)	1.0	ls	\$ 12,438.15	\$ 12,438
	Building Demolition				\$ 732,764
16	Building demolition - Production Building	1.0	ls	\$ 521,226.47	\$ 521,226
17	Building demolition - Building 1	1.0	ls	\$ 14,968.25	\$ 14,968
18	Building demolition - Building 2	1.0	ls	\$ 142,045.63	\$ 142,046
19	Building demolition - Building 3	1.0	ls	\$ 53,087.26	\$ 53,087
20	Building demolition - Walkway	1.0	ls	\$ 1,436.95	\$ 1,437

Appendix D
Cost Savings - Leave Slab Foundations in Place for Structures Previously Removed
Des Moines TCE Site
Des Moines, Iowa

Table D-5					
Alternative 2B - Building Demolition with Off-site Disposal (75% Hazardous)					
Item	Description	Quantity	Unit	Unit Price (Incl. O&P)	Total Cost
	Slab Demolition				\$ 217,855
21	Slab demolition - Production Building (partial)	1.0	ls	\$ 130,086.63	\$ 130,087
22	Slab demolition - Building 1	1.0	ls	\$ 6,109.47	\$ 6,109
23	Slab demolition - Building 2	1.0	ls	\$ 57,971.81	\$ 57,972
24	Slab demolition - Building 3 (partial)	1.0	ls	\$ 23,686.98	\$ 23,687
	Waste Characterization				\$ 341,223
25	Sampling and analysis for pesticides, PCBs, VOCs, and dioxins (185 building debris samples [4 samples per 1,000 cy] and 100 wastewater samples)	1.0	ls	\$ 341,222.68	\$ 341,223
	Transportation and Disposal				\$ 3,063,602
26	Dump charges (non-hazardous waste)	23,181.0	ton	\$ 39.90	\$ 924,922
27	Load and haul (non-hazardous waste)	23,181.0	ton	\$ 22.37	\$ 518,443
28	Transportation and disposal (hazardous)	5,729.0	ton	\$ 282.81	\$ 1,620,237
	Capping				\$ 459,062
29	Seeding, vegetative cover	3.3	ac	\$ 5,158.60	\$ 17,075
30	Topsoil, 6 inches deep	3,335.6	lcy	\$ 52.69	\$ 175,740
31	Fill, 6 inches deep	3,335.6	cy	\$ 36.04	\$ 120,218
32	Clay, low permeability, 6 inches deep	3,735.8	cy	\$ 39.09	\$ 146,029
	Measurement				\$ 62,932
33	Pre-construction surveying	14.0	days	\$ 2,247.59	\$ 31,466
34	Post-construction surveying	14.0	days	\$ 2,247.59	\$ 31,466
Construction subtotal					\$ 6,374,424
Construction Contractor Mobe/Demobe, Site Prep and Submittals					\$ 637,442
Pre-design investigation					\$ 637,442
Engineering design					\$ 1,147,396
Project management and construction oversight					\$ 446,210
Recycling of metal (14,780 tons at \$90 per ton)					\$ (1,330,200)
Capital Cost Subtotal					\$ 7,912,715

Notes:
ac Acre
cy Cubic yard
lcy Linear cubic yard
ls Lump sum

Appendix D
Cost Savings - Berm Design
Des Moines TCE Site
Des Moines, Iowa

TABLE D-1			
COST SUMMARY			
Alternative	Option	Description	Total
2A	NA	Building Demolition with Off-site Disposal (25% Hazardous)	\$ 10,777,000
2B	NA	Building Demolition with Off-site Disposal (75% Hazardous)	\$ 12,614,000

Appendix D
Cost Savings - Berm Design
Des Moines TCE Site
Des Moines, Iowa

ALTERNATIVE 2A
BUILDING DEMOLITION WITH OFF-SITE DISPOSAL (25% HAZARDOUS)

Table D-2				
Alternative 2A - Building Demolition with Off-site Disposal (25% Hazardous)				
Source	Description	Subtotal	Contingency	Total (Rounded)
Table D-3	Design and Construction	\$ 8,290,250	\$ 2,487,075	\$ 10,777,000
	Contingency	30%	\$ 2,487,075	
Total			\$	10,777,000

Appendix D
Cost Savings - Berm Design
Des Moines TCE Site
Des Moines, Iowa

Capital Cost

Location factor (for zip code 433xx)

ECHOS	1
Get-a-Quote	1.04

Note: Location factor applied only to national average unit costs; not applied to local unit costs such as from vendors or Means.

Overhead and Profit (O&P)

General	25%	Typical general contractor overhead and profit
Means	-	NA
RACER	25%	NA
Contractor quote	5%	Prime contractor markup
Professional judgment	-	Not marked-up

Inflation 1.64% Avg. annual inflation from 2010 to 2017

Table D-3					
Alternative 2A - Building Demolition with Off-site Disposal (25% Hazardous)					
Item	Description	Quantity	Unit	Unit Price (Incl. O&P)	Total Cost
	Construction Subtotal				\$ 6,635,414
	Site Preparation				\$ 15,246
1	Temporary facilities	1.0	ls	\$ 15,246.00	\$ 15,246
	Asbestos Survey				\$ 8,990
2	Asbestos survey	1.0	ls	\$ 8,990.28	\$ 8,990
	Equipment Decontamination				\$ 84,386
3	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 71,948.09	\$ 71,948
4	Transportation and disposal (2,750 gallons of wastewater)	1.0	ls	\$ 12,438.15	\$ 12,438
	Asbestos Removal and Disposal				\$ 534,072
5	Asbestos removal - Production Building	1.0	ls	\$ 175,703.08	\$ 175,703
6	Asbestos removal - Building 1	1.0	ls	\$ 44,988.86	\$ 44,989
7	Asbestos removal - Building 2	1.0	ls	\$ 216,245.87	\$ 216,246
8	Asbestos removal - Building 3	1.0	ls	\$ 97,134.31	\$ 97,134
	PCB Removal and Disposal (Insulation)				\$ 754,624
9	PCB removal - Production Building	1.0	ls	\$ 216,363.38	\$ 216,363
10	PCB removal - Building 1	1.0	ls	\$ 20,856.37	\$ 20,856
11	PCB removal - Building 2	1.0	ls	\$ 84,477.92	\$ 84,478
12	PCB removal - Building 3	1.0	ls	\$ 137,953.45	\$ 137,953
13	PCB disposal	1,043.0	ton	\$ 282.81	\$ 294,974
	Metal Decontamination				\$ 99,668
14	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 87,229.76	\$ 87,230
15	Transportation and disposal (2,750 gallons of wastewater)	1.0	ls	\$ 12,438.15	\$ 12,438
	Building Demolition				\$ 732,764
16	Building demolition - Production Building	1.0	ls	\$ 521,226.47	\$ 521,226
17	Building demolition - Building 1	1.0	ls	\$ 14,968.25	\$ 14,968
18	Building demolition - Building 2	1.0	ls	\$ 142,045.63	\$ 142,046
19	Building demolition - Building 3	1.0	ls	\$ 53,087.26	\$ 53,087
20	Building demolition - Walkway	1.0	ls	\$ 1,436.95	\$ 1,437

Appendix D
Cost Savings - Berm Design
Des Moines TCE Site
Des Moines, Iowa

Table D-3					
Alternative 2A - Building Demolition with Off-site Disposal (25% Hazardous)					
Item	Description	Quantity	Unit	Unit Price (Incl. O&P)	Total Cost
	Slab Demolition				\$ 519,363
21	Slab demolition - Production Building	1.0	ls	\$ 249,575.67	\$ 249,576
22	Slab demolition - Building 1	1.0	ls	\$ 6,109.47	\$ 6,109
23	Slab demolition - Building 2	1.0	ls	\$ 57,971.81	\$ 57,972
24	Slab demolition - Building 3	1.0	ls	\$ 31,167.14	\$ 31,167
25	Slab demolition - Maintenance Building	1.0	ls	\$ 18,700.78	\$ 18,701
26	Slab demolition - Buildings 4 and 5	1.0	ls	\$ 155,838.21	\$ 155,838
	Waste Characterization				\$ 358,895
27	Sampling and analysis for pesticides, PCBs, VOCs, and dioxins (200 building debris samples [4 samples per 1,000 cy] and 100 wastewater samples)	1.0	ls	\$ 358,894.61	\$ 358,895
	Transportation and Disposal				\$ 787,352
28	Transportation and disposal (hazardous)	2,784.0	ton	\$ 282.81	\$ 787,352
	Walking Path				\$ 1,476,846
29	Clay, low permeability, 6 inches deep	10,370.8	cy	\$ 37.84	\$ 392,407
30	Fill, 6 inches deep	9,259.7	cy	\$ 34.89	\$ 323,047
31	Topsoil, 6 inches deep	9,259.7	lcy	\$ 51.00	\$ 472,244
32	Seeding, vegetative cover	9.2	ac	\$ 4,993.48	\$ 45,840
33	Sidewalk, 4 inches deep with mesh	35,979.0	sf	\$ 6.76	\$ 243,308
	Capping				\$ 1,097,064
34	Seeding, vegetative cover	7.9	ac	\$ 5,158.60	\$ 40,805
35	Topsoil, 6 inches deep	7,971.3	lcy	\$ 52.69	\$ 419,982
36	Fill, 6 inches deep	7,971.3	cy	\$ 36.04	\$ 287,297
37	Clay, low permeability, 6 inches deep	8,927.9	cy	\$ 39.09	\$ 348,980
	Crushing				\$ 103,212
38	Bulldozer (crushing non-hazardous debris for fill)	160.0	hr	\$ 267.40	\$ 42,784
39	Backhoe, 0.75 CY (crushing non-hazardous debris for fill)	160.0	hr	\$ 142.55	\$ 22,808
40	Jackhammer (crushing of non-hazardous debris for fill)	160.0	hr	\$ 235.13	\$ 37,620
	Measurement				\$ 62,932
41	Pre-construction surveying	14.0	days	\$ 2,247.59	\$ 31,466
42	Post-construction surveying	14.0	days	\$ 2,247.59	\$ 31,466
Construction subtotal				\$	6,635,414
Construction Contractor Mobe/Demobe, Site Prep and Submittals				10%	\$ 663,541
Pre-design investigation				10%	\$ 663,541
Engineering design				18%	\$ 1,194,375
Project management and construction oversight				7%	\$ 464,479
Recycling of metal (14,790 tons at \$90 per ton)					\$ (1,331,100)
Capital Cost Subtotal				\$	8,290,250

Notes:

ac Acre
cy Cubic yard
hr Hour
lcy Linear cubic yard
ls Lump sum
sf Square foot

Appendix D
Cost Savings - Berm Design
Des Moines TCE Site
Des Moines, Iowa

ALTERNATIVE 2B
BUILDING DEMOLITION WITH OFF-SITE DISPOSAL (75% HAZARDOUS)

Table D-4				
Alternative 2B - Building Demolition with Off-site Disposal (75% Hazardous)				
Source	Description	Subtotal	Contingency	Total (Rounded)
Table D-5	Design and Construction	\$ 9,703,168	\$ 2,910,950	\$ 12,614,000
	Contingency	30%	\$ 2,910,950	
Total				\$ 12,614,000

Appendix D
Cost Savings - Berm Design
Des Moines TCE Site
Des Moines, Iowa

Capital Cost

Location factor (for zip code 433xx)

ECHOS	1
Get-a-Quote	1.04

Note: Location factor applied only to national average unit costs; not applied to local unit costs such as from vendors or Means.

Overhead and Profit (O&P)

General	25%	Typical general contractor overhead and profit
Means	-	NA
RACER	25%	NA
Contractor quote	5%	Prime contractor markup
Professional judgment	-	Not marked-up

Inflation

1.64%

Avg. annual inflation from 2010 to 2017

Table D-5					
Alternative 2B - Building Demolition with Off-site Disposal (75% Hazardous)					
Item	Description	Quantity	Unit	Unit Price (Incl. O&P)	Total Cost
	Construction Subtotal				\$ 7,609,840
	Site Preparation				\$ 15,246
1	Temporary facilities	1.0	ls	\$ 15,246.00	\$ 15,246
	Asbestos Survey				\$ 8,990
2	Asbestos survey	1.0	ls	\$ 8,990.28	\$ 8,990
	Equipment Decontamination				\$ 84,386
3	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 71,948.09	\$ 71,948
4	Transportation and disposal (2,750 gallons of wastewater)	1.0	ls	\$ 12,438.15	\$ 12,438
	Asbestos Removal and Disposal				\$ 534,072
5	Asbestos removal - Production Building	1.0	ls	\$ 175,703.08	\$ 175,703
6	Asbestos removal - Building 1	1.0	ls	\$ 44,988.86	\$ 44,989
7	Asbestos removal - Building 2	1.0	ls	\$ 216,245.87	\$ 216,246
8	Asbestos removal - Building 3	1.0	ls	\$ 97,134.31	\$ 97,134
	PCB Removal and Disposal				\$ 754,624
9	PCB removal - Production Building	1.0	ls	\$ 216,363.38	\$ 216,363
10	PCB removal - Building 1	1.0	ls	\$ 20,856.37	\$ 20,856
11	PCB removal - Building 2	1.0	ls	\$ 84,477.92	\$ 84,478
12	PCB removal - Building 3	1.0	ls	\$ 137,953.45	\$ 137,953
13	PCB disposal	1,043.0	ton	\$ 282.81	\$ 294,974
	Metal Decontamination				\$ 99,668
14	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 87,229.76	\$ 87,230
15	Transportation and disposal (2,750 gallons of wastewater)	1.0	ls	\$ 12,438.15	\$ 12,438
	Building Demolition				\$ 732,764
16	Building demolition - Production Building	1.0	ls	\$ 521,226.47	\$ 521,226
17	Building demolition - Building 1	1.0	ls	\$ 14,968.25	\$ 14,968
18	Building demolition - Building 2	1.0	ls	\$ 142,045.63	\$ 142,046
19	Building demolition - Building 3	1.0	ls	\$ 53,087.26	\$ 53,087
20	Building demolition - Walkway	1.0	ls	\$ 1,436.95	\$ 1,437

Appendix D
Cost Savings - Berm Design
Des Moines TCE Site
Des Moines, Iowa

Table D-5					
Alternative 2B - Building Demolition with Off-site Disposal (75% Hazardous)					
Item	Description	Quantity	Unit	Unit Price (Incl. O&P)	Total Cost
	Slab Demolition				\$ 519,363
21	Slab demolition - Production Building	1.0	ls	\$ 249,575.67	\$ 249,576
22	Slab demolition - Building 1	1.0	ls	\$ 6,109.47	\$ 6,109
23	Slab demolition - Building 2	1.0	ls	\$ 57,971.81	\$ 57,972
24	Slab demolition - Building 3	1.0	ls	\$ 31,167.14	\$ 31,167
25	Slab demolition - Maintenance Building	1.0	ls	\$ 18,700.78	\$ 18,701
26	Slab demolition - Buildings 4 and 5	1.0	ls	\$ 155,838.21	\$ 155,838
	Waste Characterization				\$ 358,895
27	Sampling and analysis for pesticides, PCBs, VOCs, and dioxins (200 building debris samples [4 samples per 1,000 cy] and 100 wastewater samples)	1.0	ls	\$ 358,894.61	\$ 358,895
	Transportation and Disposal				\$ 1,956,785
28	Transportation and disposal (hazardous)	6,919.0	ton	\$ 282.81	\$ 1,956,785
	Walking Path				\$ 1,281,839
29	Clay, low permeability, 6 inches deep	8,731.3	cy	\$ 37.84	\$ 330,370
30	Fill, 6 inches deep	7,795.8	cy	\$ 34.89	\$ 271,976
31	Topsoil, 6 inches deep	7,795.8	lcy	\$ 51.00	\$ 397,585
32	Seeding, vegetative cover	7.7	ac	\$ 4,993.48	\$ 38,600
33	Sidewalk, 4 inches deep with mesh	35,979.0	sf	\$ 6.76	\$ 243,308
	Capping				\$ 1,097,064
34	Seeding, vegetative cover	7.9	ac	\$ 5,158.60	\$ 40,805
35	Topsoil, 6 inches deep	7,971.3	lcy	\$ 52.69	\$ 419,982
36	Fill, 6 inches deep	7,971.3	cy	\$ 36.04	\$ 287,297
37	Clay, low permeability, 6 inches deep	8,927.9	cy	\$ 39.09	\$ 348,980
	Crushing				\$ 103,212
38	Bulldozer (crushing non-hazardous debris for fill)	160.0	hr	\$ 267.40	\$ 42,784
39	Backhoe, 0.75 CY (crushing non-hazardous debris for fill)	160.0	hr	\$ 142.55	\$ 22,808
40	Jackhammer (crushing of non-hazardous debris for fill)	160.0	hr	\$ 235.13	\$ 37,620
	Measurement				\$ 62,932
41	Pre-construction surveying	14.0	days	\$ 2,247.59	\$ 31,466
42	Post-construction surveying	14.0	days	\$ 2,247.59	\$ 31,466
Construction subtotal					\$ 7,609,840
Construction Contractor Mobe/Demobe, Site Prep and Submittals					\$ 760,984
Pre-design investigation					\$ 760,984
Engineering design					\$ 1,369,771
Project management and construction oversight					\$ 532,689
Recycling of metal (14,790 tons at \$90 per ton)					\$ (1,331,100)
Capital Cost Subtotal					\$ 9,703,168

Notes:

ac Acre

cy Cubic yard

hr Hour

lcy Linear cubic yard

ls Lump sum

sf Square foot

ALTERNATIVE 3

BUILDING DEMOLITION WITH ON-SITE CONTAINMENT

Appendix D
Cost Savings - No Cap
Des Moines TCE Site
Des Moines, Iowa

TABLE D-1			
COST SUMMARY			
Alternative	Option	Description	Total
3	NA	Building Demolition with On-site Containment (25-75% Hazardous)	\$ 10,319,000

Appendix D
Cost Savings - No Cap
Des Moines TCE Site
Des Moines, Iowa

ALTERNATIVE 3
BUILDING DEMOLITION WITH ON-SITE CONTAINMENT (25-75% HAZARDOUS)

Table D-2				
Alternative 3 - Building Demolition with On-site Containment (25-75% Hazardous)				
Source	Description	Subtotal	Contingency	Total (Rounded)
Table D-3	Design and Construction	\$ 7,937,521	\$ 2,381,256	\$ 10,319,000
	Contingency	30%	\$ 2,381,256	
	Total			\$ 10,319,000

Appendix D
Cost Savings - No Cap
Des Moines TCE Site
Des Moines, Iowa

Capital Cost

Location factor (for zip code 433xx)

ECHOS

Get-a-Quote

1
1.04

Note: Location factor applied only to national average unit costs; not applied to local unit costs such as from vendors or Means.

Overhead and Profit (O&P)

General

Means

RACER

Contractor quote

Professional judgment

25%
-
25%
5%
-

Typical general contractor overhead and profit

NA

NA

Prime contractor markup

Not marked-up

Inflation

1.64%

Avg. annual inflation from 2010 to 2017

Table D-3					
Alternative 3 - Building Demolition with On-site Containment (25-75% Hazardous)					
Item	Description	Quantity	Unit	Unit Price (Incl. O&P)	Total Cost
	Construction Subtotal				\$ 6,390,911
	Site Preparation				\$ 15,246
1	Temporary facilities	1.0	ls	\$ 15,246.00	\$ 15,246
	Asbestos Survey				\$ 8,990
2	Asbestos survey	1.0	ls	\$ 8,990.28	\$ 8,990
	Equipment Decontamination				\$ 83,920
3	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 71,948.09	\$ 71,948
4	Transportation and disposal (2,400 gallons of wastewater)	1.0	ls	\$ 11,971.98	\$ 11,972
	Asbestos Removal and Disposal				\$ 534,072
5	Asbestos removal - Production Building	1.0	ls	\$ 175,703.08	\$ 175,703
6	Asbestos removal - Building 1	1.0	ls	\$ 44,988.86	\$ 44,989
7	Asbestos removal - Building 2	1.0	ls	\$ 216,245.87	\$ 216,246
8	Asbestos removal - Building 3	1.0	ls	\$ 97,134.31	\$ 97,134
	PCB Removal and Disposal				\$ 747,032
9	PCB removal - Production Building	1.0	ls	\$ 209,437.50	\$ 209,438
10	PCB removal - Building 1	1.0	ls	\$ 20,188.75	\$ 20,189
11	PCB removal - Building 2	1.0	ls	\$ 84,477.92	\$ 84,478
12	PCB removal - Building 3	1.0	ls	\$ 137,953.45	\$ 137,953
13	PCB disposal	1,043.0	ton	\$ 282.81	\$ 294,974
	Metal Decontamination				\$ 99,202
14	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 87,229.76	\$ 87,230
15	Transportation and disposal (2,400 gallons of wastewater)	1.0	ls	\$ 11,971.98	\$ 11,972
	Building Demolition				\$ 732,764
16	Building demolition - Production Building	1.0	ls	\$ 521,226.47	\$ 521,226
17	Building demolition - Building 1	1.0	ls	\$ 14,968.25	\$ 14,968
18	Building demolition - Building 2	1.0	ls	\$ 142,045.63	\$ 142,046
19	Building demolition - Building 3	1.0	ls	\$ 53,087.26	\$ 53,087
20	Building demolition - Walkway	1.0	ls	\$ 1,436.95	\$ 1,437

Appendix D
Cost Savings - No Cap
Des Moines TCE Site
Des Moines, Iowa

Table D-3					
Alternative 3 - Building Demolition with On-site Containment (25-75% Hazardous)					
Item	Description	Quantity	Unit	Unit Price (Incl. O&P)	Total Cost
	Waste Characterization				\$ 329,441
21	Sampling and analysis for pesticides, PCBs, VOCs, and dioxins (175 building debris samples [4 samples per 1,000 cy] and 100 wastewater samples)	1.0	ls	\$ 329,440.53	\$ 329,441
	Prescriptive Cap				\$ 3,244,187
22	Seeding, vegetative cover	4.1	ac	\$ 5,158.60	\$ 21,357
23	Topsoil, 12 inches deep	8,356.7	lcy	\$ 52.69	\$ 440,286
24	Fill, 6 inch lifts (includes delivery, spreading, and compaction)	25,070.2	cy	\$ 36.04	\$ 903,558
25	Clay, low permeability, 2 feet (includes 0.8-1.4 feet debris foundation layer)	18,719.1	cy	\$ 39.09	\$ 731,704
26	Drainage netting, geotextile fabric heat-bonded 2 sides	198,555.6	sf	\$ 0.88	\$ 174,353
27	60 Mil polymetric liner, high-density polyethylene	198,555.6	sf	\$ 0.96	\$ 189,737
28	Sodium bentonite flocculant aid	1,263,536.0	lb	\$ 0.62	\$ 783,192
	Crushing				\$ 533,125
29	Bulldozer (crushing debris for fill)	800.0	hr	\$ 276.24	\$ 220,994
30	Backhoe, 0.75 CY (crushing debris for fill)	800.0	hr	\$ 147.26	\$ 117,811
31	Jackhammer (crushing of debris for fill)	800.0	hr	\$ 242.90	\$ 194,320
	Measurement				\$ 62,932
32	Pre-construction surveying	14.0	days	\$ 2,247.59	\$ 31,466
33	Post-construction surveying	14.0	days	\$ 2,247.59	\$ 31,466
Construction subtotal					\$ 6,390,911
Construction Contractor Mobe/Demobe, Site Prep and Submittals					\$ 639,091.10
Pre-design investigation					\$ 639,091.10
Engineering design					\$ 1,150,363.98
Project management and construction oversight					\$ 447,363.77
Recycling of metal (14,770 tons at \$90 per ton)					\$ (1,329,300.00)
Capital Cost Subtotal					\$ 7,937,521

Notes:

ac	Acre
cy	Cubic yard
hr	Hour
lb	Pound
lcy	Loose cubic yard
ls	Lump sum
sf	Square foot
sy	Square yard

Appendix D
Cost Savings - Berm Design
Des Moines TCE Site
Des Moines, Iowa

TABLE D-1			
COST SUMMARY			
Alternative	Option	Description	Total
3	NA	Building Demolition with On-site Containment (25-75% Hazardous)	\$ 13,357,000

Appendix D
Cost Savings - Berm Design
Des Moines TCE Site
Des Moines, Iowa

ALTERNATIVE 3
BUILDING DEMOLITION WITH ON-SITE CONTAINMENT (25-75% HAZARDOUS)

Table D-2				
Alternative 3 - Building Demolition with On-site Containment (25-75% Hazardous)				
Source	Description	Subtotal	Contingency	Total (Rounded)
Table D-3	Design and Construction	\$ 10,274,905	\$ 3,082,472	\$ 13,357,000
	Contingency	30%	\$ 3,082,472	
	Total			\$ 13,357,000

Appendix D
Cost Savings - Berm Design
Des Moines TCE Site
Des Moines, Iowa

Capital Cost

Location factor (for zip code 433xx)

ECHOS

Get-a-Quote

1
1.04

Note: Location factor applied only to national average unit costs; not applied to local unit costs such as from vendors or Means.

Overhead and Profit (O&P)

General

Means

RACER

Contractor quote

Professional judgment

25%
-
25%
5%
-

Typical general contractor overhead and profit

NA

NA

Prime contractor markup

Not marked-up

Inflation

1.64%

Avg. annual inflation from 2010 to 2017

Table D-3					
Alternative 3 - Building Demolition with On-site Containment (25-75% Hazardous)					
Item	Description	Quantity	Unit	Unit Price (Incl. O&P)	Total Cost
	Construction Subtotal				\$ 8,002,900
	Site Preparation				\$ 15,246
1	Temporary facilities	1.0	ls	\$ 15,246.00	\$ 15,246
	Asbestos Survey				\$ 8,990
2	Asbestos survey	1.0	ls	\$ 8,990.28	\$ 8,990
	Equipment Decontamination				\$ 83,920
3	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 71,948.09	\$ 71,948
4	Transportation and disposal (2,400 gallons of wastewater)	1.0	ls	\$ 11,971.98	\$ 11,972
	Asbestos Removal and Disposal				\$ 534,072
5	Asbestos removal - Production Building	1.0	ls	\$ 175,703.08	\$ 175,703
6	Asbestos removal - Building 1	1.0	ls	\$ 44,988.86	\$ 44,989
7	Asbestos removal - Building 2	1.0	ls	\$ 216,245.87	\$ 216,246
8	Asbestos removal - Building 3	1.0	ls	\$ 97,134.31	\$ 97,134
	PCB Removal and Disposal				\$ 747,032
9	PCB removal - Production Building	1.0	ls	\$ 209,437.50	\$ 209,438
10	PCB removal - Building 1	1.0	ls	\$ 20,188.75	\$ 20,189
11	PCB removal - Building 2	1.0	ls	\$ 84,477.92	\$ 84,478
12	PCB removal - Building 3	1.0	ls	\$ 137,953.45	\$ 137,953
13	PCB disposal	1,043.0	ton	\$ 282.81	\$ 294,974
	Metal Decontamination				\$ 99,202
14	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 87,229.76	\$ 87,230
15	Transportation and disposal (2,400 gallons of wastewater)	1.0	ls	\$ 11,971.98	\$ 11,972
	Building Demolition				\$ 732,764
16	Building demolition - Production Building	1.0	ls	\$ 521,226.47	\$ 521,226
17	Building demolition - Building 1	1.0	ls	\$ 14,968.25	\$ 14,968
18	Building demolition - Building 2	1.0	ls	\$ 142,045.63	\$ 142,046
19	Building demolition - Building 3	1.0	ls	\$ 53,087.26	\$ 53,087
20	Building demolition - Walkway	1.0	ls	\$ 1,436.95	\$ 1,437

Appendix D
Cost Savings - Berm Design
Des Moines TCE Site
Des Moines, Iowa

Table D-3					
Alternative 3 - Building Demolition with On-site Containment (25-75% Hazardous)					
Item	Description	Quantity	Unit	Unit Price (Incl. O&P)	Total Cost
	Waste Characterization				\$ 329,441
21	Sampling and analysis for pesticides, PCBs, VOCs, and dioxins (175 building debris samples [4 samples per 1,000 cy] and 100 wastewater samples)	1.0	ls	\$ 329,440.53	\$ 329,441
	Vegetative Cap				\$ 330,150
22	Seeding, vegetative cover	2.4	ac	\$ 5,158.60	\$ 12,277
23	Topsoil, 6 inches deep	2,398.9	lcy	\$ 52.69	\$ 126,390
24	Fill, 6 inches deep	2,398.9	cy	\$ 36.04	\$ 86,460
25	Clay, low permeability, 6 inches deep (includes 1.6-1.8 feet debris foundation layer)	2,686.8	cy	\$ 39.09	\$ 105,023
	Walking Path				\$ 1,281,839
25	Clay, low permeability, 6 inches deep	8,731.3	cy	\$ 37.84	\$ 330,370
26	Fill, 6 inches deep	7,795.8	cy	\$ 34.89	\$ 271,976
27	Topsoil, 6 inches deep	7,795.8	lcy	\$ 51.00	\$ 397,585
28	Seeding, vegetative cover	7.7	ac	\$ 4,993.48	\$ 38,600
29	Sidewalk, 4 inches deep with mesh	35,979.0	sf	\$ 6.76	\$ 243,308
	Prescriptive Cap				\$ 3,244,187
25	Seeding, vegetative cover	4.1	ac	\$ 5,158.60	\$ 21,357
26	Topsoil, 12 inches deep	8,356.7	lcy	\$ 52.69	\$ 440,286
27	Fill, 6 inch lifts (includes delivery, spreading, and compaction)	25,070.2	cy	\$ 36.04	\$ 903,558
28	Clay, low permeability, 2 feet (includes 0.8-1.4 feet debris foundation layer)	18,719.1	cy	\$ 39.09	\$ 731,704
29	Drainage netting, geotextile fabric heat-bonded 2 sides	198,555.6	sf	\$ 0.88	\$ 174,353
30	60 Mil polymetric liner, high-density polyethylene	198,555.6	sf	\$ 0.96	\$ 189,737
31	Sodium bentonite flocculant aid	1,263,536.0	lb	\$ 0.62	\$ 783,192
	Crushing				\$ 533,125
32	Bulldozer (crushing debris for fill)	800.0	hr	\$ 276.24	\$ 220,994
33	Backhoe, 0.75 CY (crushing debris for fill)	800.0	hr	\$ 147.26	\$ 117,811
34	Jackhammer (crushing of debris for fill)	800.0	hr	\$ 242.90	\$ 194,320
	Measurement				\$ 62,932
35	Pre-construction surveying	14.0	days	\$ 2,247.59	\$ 31,466
36	Post-construction surveying	14.0	days	\$ 2,247.59	\$ 31,466
Construction subtotal					\$ 8,002,900
Construction Contractor Mobe/Demobe, Site Prep and Submittals					10% \$ 800,290.00
Pre-design investigation					10% \$ 800,290.00
Engineering design					18% \$ 1,440,522.00
Project management and construction oversight					7% \$ 560,203.00
Recycling of metal (14,770 tons at \$90 per ton)					\$ (1,329,300.00)
Capital Cost Subtotal					\$ 10,274,905

Notes:

ac Acre
cy Cubic yard
hr Hour
lb Pound
lcy Loose cubic yard
ls Lump sum
sf Square foot
sy Square yard